L318
H

REGISTER

OF

LEHIGH UNIVERSITY

1922-1923

BETHLEHEM
PENNSYLVANIA

1922

JULY

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1923

JANUARY

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1924

JANUARY

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MARCH

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APRIL

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JUNE

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CALENDAR

1922 1922—1923

Sept. 15, 16, 18, 19, (Friday, Saturday, Monday, Tuesday)	Examinations for admission.
Sept. 20, 3.30 P.M., (Wednesday)	First term begins.
Oct. 7, (Saturday)	Founder's Day.
Nov. 29, 4.00 P.M,, (Wednesday)	Thanksgiving holidays begin.
Dec. 4, 7.45 A.M., (Monday)	Thanksgiving holidays end.
Dec. 20, 4.00 P.M., (Wednesday)	Christmas holidays begin.
1923	
Jan. 4, 7.45 A.M., (Thursday)	Christmas holidays end.
Jan. 29, 8.00 A.M., (Monday)	Examinations begin.
Feb. 3, 5.00 P.M., (Saturday)	Examinations end.
Feb. 8, 7.45 A.M., (Thursday)	Second term begins.
Feb. 22, (Thursday, Washington's Birthday)	Junior Oratorical Contest.
March 28, 4.00 P.M., (Wednesday)	Easter holidays begin.
April 2, 7.45 A.M., (Monday)	Easter holidays end.
May 28, 8.00 A.M., (Monday)	Senior examinations begin.
May 30, 8.00 A.M., (Wednesday)	Other examinations begin.
June 6, 5.00 P.M., (Wednesday)	Examinations end.
June 9, (Saturday)	Alumni Day.
June 10, (Sunday)	Baccalaureate Sunday.
June 11, (Monday)	Class Day.
June 12, (Tuesday)	University Day.
June 13, (Wednesday)	Summer term begins.
June 13, 14, 15, 16, (Wednesday, Thursday, Friday, Saturday)	Examinations for admission.

1923 1923—1924

Sept. 14, 15, 17, 18, (Friday, Saturday, Monday, Tuesday)	Examinations for admission.
Sept. 19, 3.30 P.M., (Wednesday)	First term begins.
Oct. 6, (Saturday)	Founder's Day.
Nov. 28, 4.00 P.M., (Wednesday)	Thanksgiving holidays begin.
Dec. 3, 7.45 A.M., (Monday)	Thanksgiving holidays end.
Dec. 19, 4.00 P.M., (Wednesday)	Christmas holidays begin.
1924	
Jan. 3, 7.45 A.M., (Thursday)	Christmas holidays end.
Jan. 28, 8.00 A.M., (Monday)	Examinations begin.
Feb. 2, 5.00 P.M., (Saturday)	Examinations end.
Feb. 7, 7.45 A.M., (Thursday)	Second term begins.
Feb. 22, (Friday, Washington's Birthday)	Junior Oratorical Contest.
April 16, 4.00 P.M., (Wednesday)	Easter holidays begin.
April 21, 7.45 A.M., (Monday)	Easter holidays end.
May 26, 8.00 A.M., (Monday)	Senior examinations begin.
May 28, 8.00 A.M., (Wednesday)	Other examinations begin.
June 4, 5.00 P.M., (Wednesday)	Examinations end.
June 7, (Saturday)	Alumni Day.
June 8, (Sunday)	Baccalaureate Sunday.
June 9, (Monday)	Class Day.
June 10, (Tuesday)	University Day.
June 11, (Wednesday)	Summer term begins.
June 11, 12, 13, 14, (Wednesday, Thursday, Friday, Saturday)	Examinations for admission.

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* Died December, 1922.

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JOHN L. STEWART, *Director of the Library*
PHILIP M. PALMER, *Head of the College of Arts and Science*
PERCY HUGHES, *Director of Extension Courses*
FREDERICK R. ASHBAUGH, *Bursar and Purchasing Agent*

OTHER OFFICERS

J. CLARENCE CRANMER, *Superintendent of Buildings and Grounds*

JOHN D. HARTIGAN, *Master Mechanic*
GEORGE B. MATTHEWS, *Steward of the College Commons; in charge of Dormitories and Drown Memorial Hall*

COMMITTEES OF THE FACULTY

Admission: PROFESSORS HUGHES, THORNBURG, PALMER, FOX, FRY, BABASINIAN, LUCH

Athletics: PROFESSORS REITER, ECKFELDT, WILSON

Discipline: PROFESSORS BABASINIAN, LANG, MACNUTT. *Alternative Member:* PROFESSOR LARKIN

Educational Policy: PROFESSORS MILLER, LAMBERT, PALMER, THORNBURG, LARKIN

Extension Courses: PROFESSORS SCHEALER, HUGHES, LUCH, CHAPMAN, BICKLEY, ROUSH

Graduate Courses: PROFESSORS MORE, HALL, FOX, BABASINIAN, MILLER

Honorary Degrees: PROFESSORS PALMER, STEWART, ECKFELDT, ESTY, MILLER, FOX

Petitions: PROFESSORS THORNBURG, CHAPMAN, SCHEALER

Standing of Students: PROFESSORS THORNBURG, STEWART, ESTY, ECKFELDT, ULLMANN, PALMER, MACNUTT, FOGG, LARKIN, ROUSH

Student Activities: PROFESSORS SCHEALER, ECKFELDT, FRAIM, LANG, BEAVER

LIBRARY

Director

JOHN L. STEWART, A.B., PH.B.
678 Ostrum Street

Assistant Librarian

PETER F. STAUFFER
519 Wyandotte Street

PACKER MEMORIAL CHURCH

Chaplain

REV. D. WILMOT GATESON, A.B.
321 Wyandotte Street

Organist

T. EDGAR SHIELDS, A. A. G. O.
4 East Church Street

LEHIGH UNIVERSITY

Lehigh University was chartered by the Legislature of Pennsylvania by act dated February 9, 1866. In 1865 the Hon. Asa Packer, of Mauch Chunk, inaugurated a movement to provide an institution that would afford training and education in the learned professions as then recognized, and in technical branches, the importance of which was then just becoming apparent in the development of the industrial and transportation interests of the country. He made an initial donation of $500,000 and of a large tract of land for this purpose, to which he added largely during his lifetime and by his will.

Since its foundation the equipment and resources of the University have steadily increased due to the continued interest of the University's trustees, alumni and friends. The present endowment totals $3,000,000. The first important addition to the University's original plant was the Sayre Observatory, donated in 1869 by Robert H. Sayre, of Bethlehem. Later donations include Packer Memorial Church, 1887; Williams Hall, 1902; Drown Memorial Hall, 1907; the University Commons, 1907; the Wilbur Heating Plant and Engineering Laboratory, 1907; Taylor Hall, 1907; Sayre Park, 1909; Coxe Mining Laboratory, 1910; Fritz Engineering Laboratory, 1910; Taylor Gymnasium and Taylor Field, 1913.

Lehigh University offers the following courses:

COLLEGE OF ARTS AND SCIENCE:

1. The Course in Arts and Science.

COLLEGE OF BUSINESS ADMINISTRATION:

1. The Course in Business Administration.

COLLEGE OF ENGINEERING:

1. The Course in Civil Engineering.
2. The Course in Mechanical Engineering.
3. The Course in Metallurgy.
4. The Course in Mining Engineering.
5. The Course in Electrical Engineering.
6. The Course in Chemistry.
7. The Course in Chemical Engineering.
8. The Course in Ship Construction and Marine Transportation.

Courses are described in detail on pages 32 to 76.

REQUIREMENTS FOR ADMISSION

Candidates for admission to Lehigh University must be at least sixteen years of age, must present testimonials of good moral character, and must be qualified in fifteen entrance units as enumerated below.

THE COLLEGE OF ARTS AND SCIENCE

Candidates for admission to the College of Arts and Science must present the following subjects:

	Units
English,	3
History,	1
Elementary Algebra, A and B,	1½
Plane Geometry,	1
Latin A and B or German A or French A or Spanish A,	2
Elective Subjects,	6½
	15

THE COLLEGE OF BUSINESS ADMINISTRATION

Candidates for admission to the College of Business Administration must present the following subjects:

	Units
English,	3
History,	1
Elementary Algebra, A and B,	1½
Plane Geometry,	1
German A or French A or Spanish A or Latin A and B,	2
Elective Subjects,	6½
	15

THE COLLEGE OF ENGINEERING

Candidates for admission to the College of Engineering must present the following subjects:

	Units
English,	3
History,	1
Elementary Algebra, A and B,	1½
Plane Geometry,	1
Solid Geometry,	½
Plane Trigonometry and Logarithms,	½
German A or French A or Spanish A,	2
Elective Subjects,	5½
	15

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[*] A unit represents a year's study in any subject in a secondary school, constituting approximately a quarter of a full year's work. A four-year secondary school curriculum should be regarded as representing not more than sixteen units of work.

ELECTIVE SUBJECTS

	Units
Advanced Algebra,	½
Solid Geometry,	½
Plane Trigonometry and Logarithms,	½
Greek,	1, 2 or 3
Latin,	1, 2, 3 or 4
French,	1, 2 or 3
German,	1, 2 or 3
Spanish,	1, 2 or 3
American History,	1
Ancient History,	½ or 1
Modern History,	1
English History,	½ or 1
Civics,	½, 1 or 1½
Economics,	½ or 1
General Science,	1
Physics	1
Chemistry,	1
Biology,	½ or 1
Physiology and Hygiene,	½ or 1
Physiography,	½ or 1
Manual Training,	½ or 1
Freehand Drawing,	½
Mechanical Drawing,	½
Industrial History,	½ or 1
Commercial Geography,	½ or 1
Bookkeeping, Stenography and Typewriting,	1 or 2

Other subjects from the curriculum of a high school of the first class may be credited up to a total of one unit.

Detailed information concerning these subjects is given on pages 23 to 31.

DATES OF EXAMINATIONS

Examinations for admission to the University are held in June and September in the following order:

First Day.—Geometry, 8 A.M.; Physics, Ancient History, 2 P.M.

Second Day.—Elementary Algebra, *A*, 8 A.M. to 10 A.M., Elementary Algebra, *B*, 10 A.M. to 12 M.; Trigonometry, 2 P.M.

Third Day.—Latin, 8 A.M.; German, French, Spanish, Greek, 2 P.M.

Fourth Day.—English, 8:30 A.M.; History, 2 P.M.

The dates for 1923 and 1924 are as follows: in 1923, Wednesday, Thursday, Friday and Saturday, June 13, 14, 15 and 16; and Friday, Saturday, Monday and Tuesday, September 14, 15, 17 and 18; in 1924, June 11, 12, 13 and 14, and September 12, 13, 15 and 16.

Examinations in subjects presented for elective units may be arranged for by correspondence with the Registrar.

Candidates for admission wishing to take examinations in any advanced subject for credit should notify the Registrar before September 1.

Certificates of the College Entrance Examination Board are accepted instead of the entrance examinations held at the University in those subjects in which the recorded grade is 60 per cent. or over.

ADMISSION TO ADVANCED STANDING

A candidate for admission to advanced standing in any course must meet the entrance requirements and in addition pass examinations in the work already done by the class which he desires to enter. These examinations are held in September, in the week preceding the opening of the University.

A student from another college or university is admitted without entrance examinations, provided he presents satisfactory credentials that he has covered the entrance subjects required at this University and has attended another college or university for one or more complete terms, evidence of which should be filed with the Registrar. If a student has been dropped from another college or university, he must present his record to the Committee on Standing of Students and terms of admission will be fixed.

Applicants who have obtained a certificate that the entrance requirements of the University are satisfied are advised to report personally to the Secretary of the Faculty. The Secretary of the Faculty will issue to the applicant a paper authorizing him to confer with the professors regarding the subjects for which he desires credit. It is necessary for an applicant to bring a certificate naming the subjects completed at another college, together with a copy of the catalogue or register of the college; and it is desirable for him to bring his drawings, field notes, computations and laboratory notebooks for inspection, and personal certificates from his teachers showing the grades attained at the college from which he comes. Professors may admit the student to advanced studies if satisfied with these evidences of proficiency, or they may require formal examinations in the subjects for which he desires credits.

Graduates of other colleges having the Bachelor's degree or its equivalent are similarly admitted to engineering courses.

The length of time for the completion of a course will depend upon the student's attainments at entrance and his ability. Every opportunity is given for the completion of a course in minimum time.

A student who anticipates taking a technical course at Lehigh University after graduation from college should so arrange his work in college as to cover as many as possible of the subjects of the Freshman and Sophomore years of the technical course he intends to enter.

ADMISSION TO GRADUATE COURSES

Graduates of Lehigh University and others having satisfactory degrees conferred elsewhere may be admitted to advanced studies as outlined on page 137.

SCHOOL CERTIFICATES

Lehigh University has no permanent arrangement with any school whereby certificates are accepted instead of entrance examinations.

Applicants for admission on certificate should request their school principals to send to the Registrar as soon as the school closes in June a complete record of their work. Blanks for this purpose are supplied by the University.

Certificates are accepted in subjects in which records are satisfactory to the professors concerned and in which the work has been completed within reasonable time limits.

For admission to the College of Engineering records in mathematical subjects will not be accepted unless there is evidence of some satisfactory school study of mathematics completed not earlier than January of the entrance year.

For admission to the College of Arts and Science and to the College of Business Administration records in mathematical subjects will not be accepted unless there is evidence of some satisfactory school study of mathematics completed not earlier than June of the year preceding the entrance year.

For admission to the College of Engineering, to the College of Arts and Science and to the College of Business Administration records in the required foreign language will not be accepted unless there is evidence of some satisfactory school study of the language completed not earlier than January of the year preceding the entrance year.

EXAMINATIONS AT SCHOOLS

Upon the request of school principals the June entrance examinations may be held at schools on the regularly scheduled dates. Requests for examination papers should be sent to the Registrar before June 1.

The detailed requirements in the various subjects are as follows:

ENGLISH

Preparation in English has three main objects: (a) command of correct and clear English, spoken and written; (b) ability to use the vernacular with accuracy and appreciation; and (c) some acquaintance with the simpler English classics.

English Grammar and Composition. The first two objects require instruction in grammar and composition. English grammar should be reviewed in the secondary school; and correct spelling and grammatical accuracy should be rigorously exacted in connection with all written work during the four years. The principles of English composition governing punctuation, the use of words, paragraphs, and the different kinds of composition, including letter writing, should be thoroughly mastered; and practice in composition, oral as well as written, should extend throughout the secondary school period. Written exercises may well comprise narration, description, and easy exposition based upon the principles of elementary rhetoric, as given in any approved high school rhetoric. It is advisable that subjects for this work be taken from the student's personal experience, general knowledge, and studies other than English, as well as from his reading in literature. Finally, special instruction in language and composition should be supported by concerted efforts of teachers in all branches to cultivate in the student the habit of using good English in his recitations and various exercises, whether oral or written, making every recitation in some degree an exercise in English.

Literature. The third object is sought by means of two lists of books, headed respectively reading and study; from which may be framed a progressive course in literature covering four years. In connection with both lists, the student should be trained in reading aloud and be encouraged to commit to memory some of the more notable passages both in verse and in prose. The books for reading and study are to be selected from the groups suggested by the Conference on Uniform Entrance Requirements in English. 3 units.

HISTORY

The requirement in History is based on the recommendation of the Committee of Seven of the American Historical Association.

ANCIENT HISTORY, with special reference to Greek and Roman History, and including also a short introductory study of the more ancient nations and the chief events of the early Middle Ages, down to the death of Charlemagne (814). 1 unit.

MEDIAEVAL AND MODERN EUROPEAN HISTORY, from the death of Charlemagne to the present time. 1 unit.

ENGLISH HISTORY, with due reference to social and political development. 1 unit.

AMERICAN HISTORY AND CIVIL GOVERNMENT, with due reference to social and political development. 1 unit.

The examination in history will be so framed as to require comparison and the use of judgment on the pupil's part rather than the mere use of memory. The examinations will presuppose the use of good text-books, collateral reading, and practice in written work. Geographical knowledge will be tested by requiring the location of places and movements on an outline map.

MATHEMATICS

ELEMENTARY ALGEBRA, A (ALGEBRA TO QUADRATICS). The four fundamental operations for rational algebraic expressions. Factoring, determination of highest common factor and lowest common multiple by factoring. Fractions, including complex fractions, and ratio and proportion. Linear equations, both numerical and literal, containing one or more unknown quantities. Problems depending on linear equations. Radicals, including the extraction of the square root of polynomials and of numbers. Exponents, including the fractional and negative. 1 unit.

Elementary Algebra, B (Quadratics and Beyond). Quadratic equations, both numerical and literal. Simple cases of equations with one or more unknown quantities, that can be solved by the methods of linear or quadratic equations. Problems depending on quadratic equations. The binomial theorem for positive integral exponents. The formulas for the *n*th term and the sum of the terms of arithmetic and geometric progressions with applications. ½ unit.

Advanced Algebra. Permutations and combinations, limited to simple cases. Complex numbers, with graphical representation of sums and differences. Determinants, chiefly of the second, third, and fourth orders, including the use of minors and the solution of linear equations. Numerical equations of higher degree, and so much of the theory of equations, with graphical methods, as is necessary for their treatment, including Descarte's rule of sign and Horner's method, but not Sturm's functions or multiple roots. ½ unit.

Plane Geometry. The usual theorems and constructions of good text-books, including the general properties of plane rectilinear figures; the circle and the measurement of angles; similar polygons; areas; regular polygons and the measurements of the circle. The solution of numerous original exercises, including loci problems. Applications to the mensuration of line and plane surfaces. 1 unit.

Solid Geometry. The usual theorems and constructions of good text-books, including the relations of planes and lines in space; the properties and measurements of prisms, pyramids, cylinders and cones; the sphere and the spherical triangle. The solution of numerous original exercises, including loci problems. Application to the mensuration of surfaces and solids. ½ unit.

Plane Trigonometry. Definitions and relations of the six trigonometric functions as ratios; circular measurement of angles. Proofs of principal formulas, in particular for the sine, cosine, and tangent of the sum and the difference of two angles, of the double angle and the half angle, the product expressions for the sum or the difference of two sines or of two cosines, etc.; the transformation of trigonometric expressions by means of these formulas. Solution of trigonometric equations of a simple character. Theory and use of logarithms (without the introduction of work involving infinite series). The solution of right and oblique triangles and practical applications. Candidates must bring their logarithmic tables to the examination. ½ unit.

Candidates must have a knowledge of the metric system and be prepared to solve problems in either Algebra or Geometry involving the use of the metric system.

PHYSICS

The course of instruction in Physics should include:

(a) The study of some standard text-book, for the purpose of obtaining a connected view of the subject; (b) instruction by lecture table demonstrations, to be used mainly for illustration of the facts and phenomena of physics; (c) individual laboratory work consisting of at least thirty experiments.

The aim of laboratory work should be to supplement the pupil's fund of concrete knowledge and to cultivate his power of accurate observation and clearness of thought and expression. The exercises should be chosen with a view to furnishing forceful illustrations of fundamental principles and their practical applications. They should be such as to yield results capable of ready interpretation, obviously in conformity with theory, and free from the disguise of unintelligible units.

1 unit.

GERMAN

Elementary German, A. This requirement follows, in the main, the recommendation of the Committee of Twelve of the Modern Language Association. It is expected that two whole years will be given to the work.

During the first year the work should comprise: (1) Careful drill in pronunciation. (2) The memorizing and frequent repetition of easy colloquial sentences. (3) Drill upon the rudiments of grammar, that is, upon the inflection of the articles, of such nouns as belong to the language of every-day life, of adjectives, pronouns, weak verbs and the more usual strong verbs; also upon the use of the more common prepositions, the simpler uses of the modal auxiliaries and the elementary rules of syntax and word-order. (4) Abundant easy exercises, designed not only to fix in mind the forms and principles of grammar, but also to cultivate readiness in the reproduction of natural forms of expression. (5) Reading of from 75 to 100 pages of graduated texts from a reader, with constant practice in translating into German easy variations upon sentences selected from the reading lesson (the teacher giving the English), and in the reproduction from memory of sentences previously read.

During the second year the work should comprise: (1) The reading of from 150 to 200 pages of literature in the form of easy stories and plays. (2) Accompanying practice, as before, in the translation into German of easy variations upon the matter read and in the off-hand reproduction, sometimes orally and sometimes in writing, of the substance of short and easy selected passages. (3) Continued drill in the rudiments of the grammar, directed to the ends of enabling the pupil, first, to use his knowledge with facility in the formation of sentences, and secondly, to state his knowledge correctly in the technical language of grammar. 2 units.

INTERMEDIATE GERMAN, B. This work should comprise, in addition to the elementary course, the reading of about 400 pages of moderately difficult prose and poetry, with constant practice in giving, sometimes orally and sometimes in writing, paraphrases, abstracts, or reproductions from memory of selected portions of the matter read; also grammatical drill upon the less usual strong verbs, the use of articles, cases, auxiliaries of all kinds, tenses and modes (with special reference to the infinitive and the subjunctive), and likewise upon word order and word formation. 1 unit.

FRENCH

ELEMENTARY FRENCH, A. This requirement follows, in the main, the recommendation of the Committee of Twelve of the Modern Language Association. It is expected that two whole years will be given to the work.

During the first year the work should comprise: (1) Careful drill in pronunciation. (2) The rudiments of grammar, including the inflection of the regular and the more common irregular verbs, the plural of nouns, the inflection of adjectives, participles and pronouns; the use of personal pronouns, common adverbs, prepositions and conjunctions; the order of words in the sentence and the elementary rules of syntax. (3) Abundant easy exercises, designed not only to fix in the memory the forms and principles of grammar, but also to cultivate readiness in the reproduction of natural forms of expression. (4) The reading of from 100 to 175 pages of graduated texts, with constant practice in translating into French easy variations of the sentences read (the teacher giving the English), and in reproducing from memory sentences previously read. (5) Writing French from dictation.

During the second year the work should comprise: (1) The reading of from 250 to 400 pages of easy modern prose in the form of stories, plays or historical or biographical sketches. (2) Constant practice, as in the previous year, in translating into French easy variations upon the texts read. (3) Frequent abstracts, sometimes oral and sometimes written, of portions of the text already read. (4) Writing French from dictation. (5) Continued drill upon the rudiments of grammar, with constant application in the construction of sentences. (6) Mastery of the forms and uses of pronouns, pronominal adjectives, of all but the rare irregular verb forms, and of the simpler uses of the conditional and subjunctive. 2 units.

Intermediate French, B. This should comprise the reading of from 400 to 600 pages of French, of ordinary difficulty, a portion to be in the dramatic form; constant practice in giving French paraphrases, abstracts or reproductions from memory of selected portions of the matter read; the study of a grammar of moderate completeness; writing from dictation. 1 unit.

SPANISH

Elementary Spanish, A. Two years' preparation, covering the following ground:

During the first year: (1) Drill in correct production of Spanish sounds. (2) The rudiments of grammar, illustrated by abundant easy exercises. (3) The reading of about 150 pages of graduated texts with constant translating into Spanish of easy variations of sentences read, the teacher giving the English. (4) Aural Drill. Practice in translating into English of Spanish words, clauses and sentences heard but not seen, the teacher giving the Spanish.

During the second year: (1) Reading of 250 to 400 pages of easy modern prose. (2) Constant practice in translating into Spanish easy variations upon the texts read. (3) Aural practice and drill in pronunciation. (4) Mastery of the form and uses of pronouns, of the subjunctive mode and of the forms of the radical changing verbs. 2 units.

INTERMEDIATE SPANISH, B. The reading of not less than 500 additional pages of Spanish prose together with the translation of at least 40 pages of simple connected English prose into Spanish. 1 unit.

LATIN

The following requirements in Latin are in accordance with the recommendation made by the American Philological Association, October, 1909.

LATIN, A and B. First and Second Year Latin. Grammar, Elementary Prose Composition. Reading of an amount not less than Cæsar, *Gallic War*, I-IV, selected by the schools from Cæsar (*Gallic War* and *Civil War*) and Nepos (*Lives*). 2 units.

LATIN, C. Third Year Latin. Reading of an amount not less than Cicero, *Orations against Catiline*, *For the Manilian Law*, and *For Archias*, selected by the schools from Cicero (*Orations*, *Letters* and *De Senectute*) and Sallust (*Catiline* and *Jugurthine War*). 1 unit.

LATIN, D. Fourth Year Latin. Reading of an amount not less than Vergil, *Aeneid*, I-VI, selecetd by the schools from Vergil (*Aeneid*, *Bucolics*, and *Georgics*) and Ovid (*Metamorphoses*, *Fasti*, *Tristia*, *Amores*). 1 unit.

GREEK

GREEK. Grammar; Elementary Prose Composition, consisting principally of detached sentences to test the candidate's knowledge of grammatical construction; Xenophon: the first four books of the *Anabasis;* the translation, at sight, of a passage from some work of Xenophon. 2 units.

GREEK. Homer's *Iliad*, I-III: The first three books of the *Iliad* (omitting II, 494-end), and the Homeric forms, constructions, and prosody. 1 unit.

CHEMISTRY

The requirement in Chemistry is based on the report of the Committee on Chemistry of the Science Department of the National Educational Association.

Elementary Chemistry. It is recommended that the candidate's preparation in chemistry include: (a) individual laboratory work, comprising at least forty exercises; (b) instruction by lecture table demonstrations, to be used mainly as a basis for questioning upon the general principles involved in the pupil's laboratory investigations; (c) the study of at least one standard text-book, to the end that the pupil may gain a comprehensive and connected view of the most important facts and laws of elementary chemistry. 1 unit.

Students, properly qualified, will be examined in Elementary Chemistry on the first Saturday of the term; those passing the examination will be privileged to omit Elementary Chemistry (390) and will, instead, take Chemistry (393) and Chemical Laboratory (393a) during the first term.

DRAWING

Freehand Drawing. Sketching of simple geometrical figures, of objects, and from copy. At least twenty plates must be submitted. ½ unit.

Mechanical Drawing. The use of instruments and the preparation of at least twenty plates, illustrating the elements of descriptive geometry or simple machine parts. ½ unit.

PHYSIOGRAPHY

Physiography. The study of a standard text-book in physical geography, that a knowledge may be gained of the essential principles, and of well-selected facts illustrating those principles. Individual laboratory work, comprising at least forty exercises with notebook, is recommended. ½ or 1 unit.

BOTANY

Botany. An amount equal to that contained in Bergen's *Foundations of Botany* with laboratory work. ½ or 1 unit.

PHYSIOLOGY AND HYGIENE

Physiology and Hygiene. A course covering approximately what is given in such a text-book as Huxley & Youman's *Physiology and Hygiene.* ½ or 1 unit.

ZOOLOGY

Zoölogy. The equivalent of Jordan, Kellogg & Heath's *Animal Studies* with laboratory work. ½ or 1 unit.

MANUAL TRAINING

Manual Training. Shop work in wood or metal in schools giving courses in manual training. ½ or 1 unit.

BOOKKEEPING, TYPEWRITING AND STENOGRAPHY

Bookkeeping, Typewriting and Stenography, covering a formal course of study at school. 1 or 2 units.

THE COLLEGE OF ARTS AND SCIENCE

The College of Arts and Science of Lehigh University represents the traditional college course, modified to meet the needs of modern life and thought. Such a course is, in its purpose, primarily informing and cultural, not vocational; it seeks to gratify intellectual curiosity, to cultivate a love of learning, to impart the knowledge and discipline which are essential to intelligent and forceful living. It has besides certain specific uses: it is the customary approach to the professions of medicine, law, theology and teaching, and the usual basis for graduate study for higher degrees.

The entrance requirements are liberal, and such as may be met readily by graduates of Pennsylvania high schools of the first class. A statement of them may be found on page 19.

The plan of study comprises required subjects and unassigned or elective subjects. The required and elective subjects occupy respectively about two-thirds and one-third of the course. The required studies embrace courses in the English, German and French languages and literatures (two years each), mathematics (trigonometry and solid geometry), chemistry (elementary chemistry and qualitative analysis), economics, history, psychology, biology, geology, and philosophy, subjects which may be regarded as fundamental to the nature and purpose of the course.

The studies of the Freshman year follow in general the subjects which have been presented for entrance. After the Freshman year the course becomes increasingly elective, a minimum of three hours weekly of electives being allowed in the Sophomore year, six in the Junior year and ten in the Senior year. An appointed member of the Faculty counsels students in the choice of their studies and keeps before them the importance of selecting their work according to a definite and constructive plan. Students are dealt with individually rather than in groups, and the effort is made to suit the studies of each to his qualifications and purpose.

The minimum course of study comprises fifteen scholastic hours or periods weekly. Work is assigned on the assumption that two hours are required by the average student to prepare adequately for a recitation. Students of proved ability, however, are not limited to this minimum after the Freshman year, and even in that year an entering student may increase his course in chemistry from three to four hours, if, as in the case of those who are preparing for the study of medicine, there is good reason. In general, the College aims at a reasonable amount of work well done, rather than a large amount indifferently done.

Instruction is given by lectures, by recitations, by the assignments of readings and topics for study and dissertations, and, when the subject admits of it, by practical work in field or laboratory. Field work or laboratory work accompanies courses in geology, physics, chemistry, biology, psychology, and allied subjects; students in advanced mathematics use, in their study of astronomy, the telescope and other instruments of the Sayre Observatory. Practice in teaching is provided in the schools of the vicinity for those who expect to follow teaching. Students residing in Leonard Hall who are preparing, under the direction of the Bishop of the Episcopal Diocese of Bethlehem, for the theological seminary have opportunity for practical religious work.

In the following plan of study the unassigned hours are filled by subjects selected from the listed elective studies. These are not necessarily confined to the year to which in the lists they are assigned, but may be taken earlier or subsequently. But this privilege is limited by considerations of the roster and the principle that the course of each student shall be systematic and not haphazard.

Students who enter with full entrance requirements in Latin and Greek (four and three units) will continue these studies during the Freshman year. A class in Beginners' Greek, open to Freshmen and Sophomores, is formed in alternate years. Students who begin Greek in College will ordinarily pursue the study of Greek for three years.

The degree of Bachelor of Arts (B.A.) is conferred upon graduates of the College of Arts and Science.

THE COURSE IN ARTS AND SCIENCE

FRESHMAN YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
English	120, 121	(3)	3	6	9	English	122, 125	(3)	3	6	9
Plane Trig.	141	(3)	3	6	9	Solid Geom.	140	(3)	3	6	9
German	77 or 70	(3)	3	6	9	German	77 or 71	(3)	3	6	9
or French	98					or French	99				
Latin or ...	45 or 54a	(3)	3	6	9	Latin or ...	46 or 54b	(3)	3	6	9
A. & M. Civil...	47					A. & M. Civil..	47				
Greek or.....	55 or 64	(3)	3	6	9	Greek or.....	56 or 64	(3)	3	6	9
Chem.&Lab.	390,392	(3)	5	4	9	or Chem...	395,397	(3)	9	0	9
M.S. & P.E...	470, 500	(2)	4	2	6	M.S. & P.E...	470, 500	(2)	4	2	6
		17	19	32	51			17	19	32	51

SOPHOMORE YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
English	123	(3)	3	6	9	English	124	(3)	3	6	9
Economics	16	(3)	3	6	9	Economics	17	(3)	3	6	9
Latin	48	(3)	3	6	9	Latin	49	(3)	3	6	9
or Greek	57					or Greek	58				
or Phys.	331					or Phys.	331				
German	78 or 77	(3)	3	6	9	German	79 or 77	(3)	3	6	9
or French	100					or French	101				
M.S. & P.E...	471, 500	(2)	4	2	6	M.S. & P.E...	471, 500	(2)	4	2	6
Electives		(3)	3	6	9	Electives		(3)	3	6	9
		17	19	32	51			17	19	32	51

JUNIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Psychology	1	(3)	3	6	9	Psychology	2	(3)	3	6	9
French	90	(3)	3	6	9	French	90	(3)	3	6	9
or German	70					or German	71				
Biology	292	(3)	5	4	9	Gen. Geology	268	(2)	2	3	5
Physical Ed.	500	(1)	2	0	2	Geol. Lab.	269	(1)	2	2	4
Electives		(6)	6	12	18	Physical Ed.	500	(1)	2	0	2
		16	19	28	47	Electives		(6)	6	12	18
								16	18	29	47

SENIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Philosophy	8	(2)	2	4	6	Philosophy	9	(2)	2	4	6
French	97	(3)	3	6	9	French	97	(3)	3	6	9
or German	77					or German	77				
Physical Ed.	500	(1)	2	0	2	Physical Ed.	500	(1)	2	0	2
Electives		(10)	10	20	30	Electives		(10)	10	20	30
		16	17	30	47			16	17	30	47

Figures under letters above indicate the following: N, course numbers in Register; C, number of credit hours a week; R, number of clock hours a week in class; P, average number of clock hours a week in outside work and preparation; T, total number of hours a week.

ELECTIVE STUDIES

In order that elective subjects may be incorporated, so far as possible, in the University roster from term to term without conflicts, students are required to submit their electives to the Professor in charge of electives, for the first term on or before May 1, for the second term on or before December 15.

SOPHOMORE ELECTIVES

FIRST TERM		SECOND TERM	
Advanced Algebra (4)	143	Plane Analytic Geom. (3)	145
European History (3)	41	European History (3)	42
Elementary Mechanics (3)	320	Mechanics & Heat (3)	321
Latin (3)	48	Physical Measurements (1)	322
Greek (3)	64 or 65	Latin (3)	49
Advanced Chemistry (3)	398	Greek (3)	64 or 65
Economic Geography (3)	35	Advanced Chemistry (3)	399
Physiography (2)	277	Economic Geography (3)	35
French (3)	92	Physiography (2)	278
or German (3)	70	French (3)	92
Education (3)	11	or German (3)	71
English (3)	132	Scientific Method (3)	10
		Spherical Trigonometry (1)	142
		Stoichiometry (1)	397
		English (3)	133
		Education (3)	12

JUNIOR ELECTIVES

FIRST TERM		SECOND TERM	
U. S. History (3)	39	U. S. History (3)	40
Latin (3)	50 or 52	Latin (3)	51 or 53
Greek (3)	55, 59 or 61	Greek (3)	56, 60 or 62
French (3)	98, 100 or 102	French (3)	99, 101 or 102
or German (3)	78, 77 or 80	or German (3)	79, 77 or 80
Spanish (3)	110	Spanish (3)	110
Dif. Cal. & S. A. Geom. (4)	146	Integral Calculus (4)	147
Higher Algebra (1)	144	Physics (3)	333
Physics (3)	333	Quantitative Analysis (5)	404,405
Quantitative Analysis (5)	400,402	Constitutional Law (3)	33
Constitutional Law (3)	33	Comparative Anatomy (3)	293
English (3)	126, 129, 130 or 132	English (3)	128, 131, 133 or 134
Mineralogy (4)	266	Education (3)	14
Education (3)	13	Education (1-3)	16
Education (1-3)	16	Italian (3)	117
Italian (3)	117	Economic Geography (3)	36
Economic Geography (3)	36	Business Law (2)	32
Business Law (2)	31	Labor Legislation (3)	23
Labor Legislation (3)	23	Geological Lab. (2)	269

SENIOR ELECTIVES

FIRST TERM		SECOND TERM	
Latin (3)	50 or 52	Latin (3)	51 or 53
Greek (3)	57, 59 or 61	Greek (3)	58, 60 or 62
German (3)	81 or 82	German (3)	81 or 82
French (3)	100, 102, 103 or 104	French (3)	101, 102, 103 or 104
Italian (3)	118	Italian (3)	118
Spanish (3)	114	Spanish (3)	114
English (3)	126, 129, 130 or 132	English (3)	128, 131, 132 or 134
Organic Chemistry (5)	408, 409	Organic Chemistry (4)	410
Banking (3)	27	Organic Chem. Lab. (3)	411
Education (1-3)	16	Banking (3)	27
Psychology (3)	3	Education (3)	15
Embryology (3)	294	Education (1-3)	16
Bacteriology (2)	296	Botany (3)	290
Experimental Psychology (1)	7	Physiology (2)	298
Finance (3)	19	Advanced Bacteriology (2)	297
International Law (3)	34	Psychology (3)	4
Physics (3)	334 or 335	Experimental Psychology (1)	7
Physics Lab. (2)	337	Finance (3)	19
Analytic Mechanics (2)	149	International Law (3)	34
Field Geology (3)	275	Physics (3)	334 or 336
Petrography (2)	276	Physics Lab. (2)	337
Differential Equations (1)	148	Astronomy (3)	150
Adv. Elec. & Mag. (2)	327	Paleontology (3)	272
Electrical Laboratory (1)	328	Geology of N. A. (3)	273
Economic Thought (3)	24	Electrical Laboratory (1)	329
		Analytic Mechanics (3)	152
		Economic Thought (3)	24

Figures in parentheses indicate number of credit hours a week. Other figures indicate course numbers.

PREPARATION FOR ENGINEERING COURSES

If a student in the College of Arts and Science contemplates becoming a candidate for a degree in technology after completion of his B.A. course, he should choose as electives during the third and fourth years of his B.A. course such science studies as are contained in the first and second years of the technical course which he wishes afterwards to complete. By carefully selecting electives, with the advice and guidance of the head of his department and the professor in charge of the technical course concerned, the graduate of the B.A. course may enter the technical course chosen as a Junior in full standing, and obtain his technical degree in two years of further study.

PRE-MEDICAL COURSES

Certain medical schools require for entrance a college course in addition to a high school course; others require a high school course yielding fourteen or more college entrance credits and at least two years in a college of liberal arts with about three-fourths of the study devoted to chemistry, physics and biology.

The following four-year course has been prepared for students who intend to enter a medical school, but plan, before doing so, to complete their college course and obtain their degree.

THE PRE-MEDICAL COURSE

FRESHMAN YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
English	120, 121	(3)	3	6	9	English	122, 125	(3)	3	6	9
Plane Trig.	141	(3)	3	6	9	Solid Geom.	140	(3)	3	6	9
German or French	77 or 70 98	(3)	3	6	9	German or French	77 or 71 99	(3)	3	6	9
Latin or A. & M. Civil	45 or 54a 47	(3)	3	6	9	Latin or A. & M. Civil	46 or 54b 47	(3)	3	6	9
Chemistry	390 or 393	(2)	2	4	6	Qual. Anal.	395	(2)	6	1	7
Chem. Lab.	391or393a	(2)	6	0	6	Stoichiometry	397	(1)	1	1	2
M.S. & P.E.	470, 500	(2)	4	2	6	M.S. & P.E.	470, 500	(2)	4	2	6
		18	24	30	54			17	23	28	51

SOPHOMORE YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
English	123	(3)	3	6	9	English	124	(3)	3	6	9
German or French	78 or 77 100	(3)	3	6	9	German or French	79 or 77 101	(3)	3	6	9
Economics	16	(3)	3	6	9	Economics	17	(3)	3	6	9
Physics	331	(3)	5	4	9	Physics	331	(3)	5	4	9
Adv. Chem.	398	(3)	3	3	6	Adv. Chem.	399	(3)	3	6	9
M.S. & P.E.	471, 500	(2)	4	2	6	M.S. & P.E.	471, 500	(2)	4	2	6
		17	21	27	48			17	21	30	51

JUNIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Psychology	1	(3)	3	6	9	Psychology	1	(3)	3	6	9
French or German	90 or 98 70	(3)	3	6	9	French or German	90 or 99 71	(3)	3	6	9
Biology	292	(5)	9	6	15	Comp. Anat.	293	(3)	5	4	9
Quant. Anal.	400	(3)	9	0	9	Quant. Anal.	404	(3)	9	0	9
Quant. An. Conf.	402	(1)	1	2	3	Quant. An. Conf.	405	(1)	1	2	3
Physics	332	(2)	2	4	6	Physics	332	(2)	2	4	6
Physical Ed.	500	(1)	2	0	2	Physical Ed.	500	(1)	2	0	2
		18	29	24	53			16	25	22	47

SENIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Philosophy	8	(2)	2	4	6	Philosophy	9	(2)	2	4	6
French or German	97 or 100 77	(3)	3	6	9	French or German	97 or 101 77	(3)	3	6	9
Org. Chem.	408	(3)	3	6	9	Org. Chem.	410	(4)	4	5	9
Org. Chem. Lab.	409	(2)	6	0	6	Org. Chem. Lab.	411	(2)	6	0	6
Embryology	294	(3)	5	4	9	Botany	290	(3)	4	4	8
Bacteriology	296	(2)	3	3	6	Psychology	4	(3)	3	6	9
Physical Ed.	500	(1)	2	0	2	Physical Ed.	500	(1)	2	0	2
		16	24	23	47			18	24	25	49

Figures under letters above indicate the following: N, course numbers in Register; C, number of credit hours a week; R, number of clock hours a week in class; P, average number of clock hours a week in outside work and preparation; T, total number of hours a week.

For students who cannot devote four years to college work, preparatory to entering upon the study of medicine, there may be arranged upon consultation, a course which will give the student the credits demanded by the medical schools for admission.

PREPARATION FOR TEACHING

In the course leading to the degree of Bachelor of Arts, outlined on pages 32 to 36, the student may, through a selection of suitable electives, equip himself to teach in high school the subject or subjects he has selected as his specialty, whether in the field of English, of ancient or modern language, of history and social science, of biology and chemistry, of physics and mathematics, or of physiography and related subjects. In the course in Business Administration he is permitted to substitute, during the Junior and Senior years, courses in distinctly pedagogical subjects sufficient to make a total of eighteen term hours. He may thus equip himself to teach in secondary schools the important branches of commerce and industry.

No one may teach in the public schools of any state without first securing a license from that state. In Pennsylvania, as in most states, the special examination for such a license is waived in the case of college graduates, provided they have completed a certain number of hours in distinctly pedagogical studies, and have applied for a provisional college certificate to teach. At the end of three years of successful experience in teaching the State of Pennsylvania issues a permanent college certificate.

The requirement in this State for a provisional college graduate certificate to teach is as follows:

Professional Training,	Eighteen semester hours.
Introduction to Teaching,	Three semester hours.
Educational Psychology,	Three semester hours.
Practice Teaching,	Six semester hours.
Elective professional studies,	Six semester hours.
Study of subject matter,	Twelve semester hours in each subject in which the candidate desires certification.

The course in Education at Lehigh University amply meets these requirements. It may be outlined thus:

SOPHOMORE YEAR

FIRST TERM		SECOND TERM	
Introduction to Teaching	(3)	History of Education	(3)

JUNIOR YEAR

FIRST TERM		SECOND TERM	
General Psychology	(3)	Educational Psychology	(3)
Principles of Secondary Education	(3)	School Efficiency	(3)
Practice Teaching	(1)	Practice Teaching	(1)

SENIOR YEAR

FIRST TERM		SECOND TERM	
Special Method	(1) or (2)	Special Method	(1) or (2)
Practice Teaching	(2)	Problems of Secondary Education	(3)
Educational Psychology (advanced)	(3)	Practice Teaching	(2)

While all these courses ordinarily are given each year, it should be understood that to secure the Provisional College Certificate to teach in Pennsylvania High Schools, a student need complete only the following:

Introduction to Teaching, Educational Psychology, for which General Psychology is a prereqisite, Practice Teaching, and two of the following: Principles of Secondary Education, Special Method, History of Education, Problems of Secondary Education, School Efficiency and Advanced Educational Psychology.

Through the courtesy and public spirit of the Boards of Education, superintendents of schools, and principals and teachers of the neighboring high schools, the plan of practice teaching outlined under course 16 has worked out very well. In these schools may be found not only modern well equipped buildings, but also excellent organization, teachers well-fitted to serve as models and critic teachers for students in education.

Here also students of Lehigh University are cordially welcomed, and have abundant opportunity for observation, with some facilities for practice.

THE PERSONAL FACTOR

Students who expect to teach upon graduation are urged to get in touch with the Department of Education early in their college career. The proper selection of studies is of great importance to future success, and by the beginning of the Sophomore year the student should, if possible, decide upon one subject for his specialty and a second subject, preferably though not necessarily related to the first, for a second string to his bow. While the State requires only that twelve semester hours be given to each subject in which the applicant will be certificated, it is safe to say that the specialty should receive not much less than twice this amount of attention.

It is desirable that during the Junior year, the student should secure the thorough review of the elements of his specialty that is furnished by the courses in Special Method. The best practice-teaching cannot be done by a man who is weak in the fundamentals of his subject through lack of recent review.

The department has prepared a "self-estimate" card, which enumerates the qualities that are most important in a teacher and some of the defects that are most dangerous. The student is encouraged to rate himself, and study how to make the most of his talents, and how to remedy his defects. Appearance and manner, the use of English, self-control, interest in and sympathy with other people, and especially with the young, physical health, interest in the sports and other activities of high school students, ideals of scholarship, loyalty and cooperation, professional purpose—these are some of the personal elements which a student who hopes to teach is invited to study in this way.

PHYSICAL EDUCATION

Whether in large or small high schools, the young teacher often finds opportunity to guide his pupils in wholesome sport and recreation. Not only the Department of Physical Education but that of Military Science and Tactics is giving to students training that should greatly add to their value in the teaching profession.

THE COLLEGE OF BUSINESS ADMINISTRATION

Requirements for admission to the College of Business Administration are given on page 19.

The aim of the Course in Business Administration is to provide a sound understanding of the structure, organization and functioning of industry, commerce and finance, and of the general causes and criteria of prosperity and depression. A study is made of the functions common to all business enterprises and of the general principles of administration. The student is shown the relation of the business executive to the various factors of business organization and control.

In addition to providing a broad training for business, this course gives opportunity to specialize in some one branch of business and to prepare for the study of law and for public service. The following groupings of subjects suggest the opportunities for specialized work:

PREPARATION FOR THE LAW

Advisers: Professor Stewart and Assistant Professor Brown

Business Law
Constitutional Law
International Law
Economics
Accounting Theory and Practice
Corporation Accounting
Statistics
Finance
Banking and Currency
Investments
Labor Legislation and Administration
Transportation
Psychology

ACCOUNTANCY

Advisers: Professor Stewart and Associate Professor Bickley

Accounting Theory and Practice
Corporation Accounting
Cost Accounting
Economics
Business Law
Constitutional Law
Statistics
Finance
Banking and Currency
Investments
Industrial Management
Transportation

FINANCE, BANKING AND INVESTMENT BUSINESS

Advisers: Professor Stewart and Assistant Professor Curtis

Finance
Banking and Currency
Investments
Statistics
Economics
Accounting Theory and Practice
Corporation Accounting
Business Law
Transportation
Constitutional Law
Economic Geography
Industrial Management
Labor Legislation and Administration

INDUSTRIAL ADMINISTRATION

Advisers: Professor Stewart and Associate Professor Bickley

Accounting Theory and Practice
Corporation Accounting
Cost Accounting
Economics
Industrial History
Economic Geography
Engineering Drawing
Psychology
Industrial Management
Labor Legislation and Administration
Business Law
Constitutional Law
Transportation
Statistics
Finance
Investments
Electives from Courses in Engineering and Chemistry

FOREIGN TRADE

Advisers: Professors Stewart and Fox,
Assistant Professor Curtis

Economic Geography of the Western Hemisphere
Economic Geography of the Eastern Hemisphere
Economics
Spanish
Statistics
Business Law
International Law
Constitutional Law
Finance
Banking and Currency
Investments
Accounting Theory and Practice
Corporation Accounting

The methods of instruction are directed to producing, so far as college training can do it, educated young men with a taste for business. Each student is trained to work and think for himself. He is put on the track of the best that is written on all sides of all important questions that fall within the range of the investigations, and if he holds an opinion he is expected to know on what grounds and to be able to express them. One of the results desired is modesty of opinion and an open-mindedness which leaves room for future growth.

The work of the College covers four years. On its completion the degree of Bachelor of Science in Business Administration is given.

THE COURSE IN BUSINESS ADMINISTRATION

FRESHMAN YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
English	120, 121	(3)	3	6	9	English	122, 125	(3)	3	6	9
Spanish or Portuguese	110 or 111 115	(3)	3	6	9	Spanish or Portuguese	110 or 111 115	(3)	3	6	9
Indus. Hist.	38	(4)	4	8	12	Indus. Hist.	38	(4)	4	8	12
Plane Trig.	141	(3)	3	6	9	Solid Geom.	140	(3)	3	6	9
Engr. Draw.	160	(3)	7	1	8	Engr. Draw.	161	(2)	5	1	6
M.S. & P.E.	470, 500	(2)	4	2	6	M.S. & P.E.	470, 500	(2)	4	2	6
		18	24	29	53			17	22	29	51

SOPHOMORE YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Physiography	277	(2)	2	4	6	Physiography	278	(2)	2	4	6
Accounting	20	(3)	3	6	9	Accounting	20	(3)	3	6	9
Const. Law	33	(3)	3	6	9	Const. Law	33	(3)	3	6	9
Economics	16	(3)	3	6	9	Economics	17	(3)	3	6	9
Ec. Geog. N. & S. A.	35	(3)	3	6	9	Ec. Geog. N. & S. A.	35	(3)	3	6	9
Spanish or Portuguese	112 or 113 116	(3)	3	6	9	Spanish or Portuguese	112 or 113 116	(3)	3	6	9
M.S. & P.E.	471, 500	(2)	4	2	6	M.S. & P.E.	471, 500	(2)	4	2	6
		19	21	36	57			19	21	36	57

JUNIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Bus. Law	31	(2)	2	4	6	Bus. Law	32	(2)	2	4	6
U. S. Hist.	39	(3)	3	6	9	U. S. Hist.	40	(3)	3	6	9
Labor Legis.	23	(3)	3	6	9	Labor Legis.	23	(3)	3	6	9
Transportation	22	(2)	2	4	6	Transportation	22	(2)	2	4	6
Statistics	26	(3)	3	6	9	Statistics	26	(3)	3	6	9
Corp. Acct. (Elec.)	21	(3)	3	9	12	Corp. Acct. (Elec.)	21	(3)	3	9	12
Corp. Fin. (Elec.)	18a	(3)	3	8	11	Corp. Fin. (Elec.)	18a	(3)	3	8	11
Ec. Geog. E. H.	36	(3)	3	6	9	Ec. Geog. E. H.	36	(3)	3	6	9
Psychology	5	(2)	2	4	6	Psychology	2	(2)	2	4	6
Physical Ed.	500	(1)	2	0	2	Psychology	6	(2)	2	4	6
		19	20	36	56			19	20	36	56

SENIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Finance	19	(3)	3	6	9	Finance	19	(3)	3	6	9
Bank. & Cur.	27	(3)	3	6	9	Bank. & Cur.	27	(3)	3	6	9
Investments	25	(3)	3	6	9	Investments	25	(3)	3	6	9
Audit. (Elec.)	21a	(3)	3	9	12	Cost Acct. (Elec.)	21b	(3)	3	9	12
European Hist.	41	(3)	3	6	9	European Hist.	42	(3)	3	6	9
Internat. Law	34	(3)	3	6	9	Internat. Law	34	(3)	3	6	9
Econ. Thought	24	(3)	3	6	9	Econ. Thought	24	(3)	3	6	9
Physical Ed.	500	(1)	2	0	2	Thesis	44a	(3)	0	9	9
		19	20	36	56	Physical Ed.	500	(1)	2	0	2
								22	20	45	65

Students may, with the approval of the Faculty, substitute for some of the subjects in the Junior and Senior Years, other subjects which will better suit their future aims.

Prospective teachers should in this connection read the statement concerning Courses for Teachers.

Figures under letters above indicate the following: N, course numbers in Register; C, number of credit hours a week; R, number of clock hours a week in class; P, average number of clock hours a week in outside work and preparation; T, total number of hours a week.

THE COLLEGE OF ENGINEERING

THE COURSE IN CIVIL ENGINEERING

The requirements for admission to the course in Civil Engineering are given on page 19.

The purpose of this course is to give a broad education in those general and scientific subjects which form the foundation of all engineering, and a special training in the field of Civil Engineering which covers the building of highways, railroads, harbors, docks and terminals, bridges, buildings, foundations, subways, tunnels, water supply and purification plants, sewerage systems and sewage disposal plants, water power development and surveying. The Department aims to teach young men how to think and how to attack new problems, to impress upon them the underlying principles of engineering and to inspire them with the desire to do their best work.

To enable the Civil Engineering graduate to deal with allied engineering problems arising in most Civil Engineering projects of today, the course includes certain special studies such as dynamos and motors, alternating currents, heat engines, metallurgy, mineralogy and geology. Courses in Business Administration, comprising economics, accounting, business law and finance, have been placed in the curriculum with the idea that the graduate should have a knowledge of the fundamentals of business. These business subjects should prove useful to young graduates whose advancements may be along sales, managerial and executive channels. The general scope of the Civil Engineering curriculum, including as it does mathematics, pure and applied science, general engineering and business subjects, affords a thorough training in system, arrangement of work, accuracy in figures and logical thinking, so that the student has not only the proper training to enter the engineering profession, but also any business organization, should he not care to strictly follow engineering work.

The first two years are devoted mostly to fundamental studies which give both general culture and prepare for the technical work of the following years. These studies include the various branches of pure mathematics, physics, chemistry, English, modern languages, drawing, descriptive geometry, mineralogy, geology and military science and tactics.

In the summer school, at the close of the Sophomore year, Land, Topographic and Railroad Surveying is given. This covers a period of five weeks, and by this arrangement the attention of students is concentrated upon surveying, thus enabling practical field operations to be exemplified in the best manner. In Geodetic Surveying, given in the Senior year, triangulations of a high degree of precision are executed. Also determinations of azimuth and adjustments of results are made by standard methods. A large collection of levels, transits and other surveying instruments enables the student to become familiar with instruments of the best type.

Strength of Materials, which presents the theory of beams, columns and shafts, and the method of computing and designing them, is given in the Junior year. Laboratory tests are made of timber, brick, iron and steel. Strength of Materials as here presented may be described as applied mechanics, that is, the application of mechanics to the design of engineering structures. The testing of materials is of great importance for the student's understanding of the mechanics of engineering and for the capacity it gives him to manipulate apparatus and to handle machines.

Roofs and Bridges receive attention throughout three terms. Analytical and graphic methods of determining stresses are taken up in Roofs and Bridges of the second term of the Junior year and in Bridge and Structural Design and Higher Structures of the Senior year. Visits are made to bridges and to bridge shops. In the Senior year designs and working drawings are prepared by each student for both a highway and a railroad bridge. Some of these drawings are made in the same manner as in drawing rooms of bridge companies and others are general, that is, design drawings only. The theory of cantilever, draw, suspension and arch structures receives detailed attention. Structural Steel Design as applied to building construction is studied in detail. The design and construction of reinforced concrete and foundations are given in the second term of the Senior year in the course in Reinforced Concrete Design and Foundations. This extended training in structural engineering furnishes a foundation for structural steel and reinforced concrete work in practice.

Hydraulic Engineering and Sanitary Engineering are treated at length. The theory of the flow of water through orifices, weirs, pipes and channels together with the principles of hydraulic motors is given in the Junior year, the work being supplemented by testing in the hydraulic laboratory. In the Senior year the subjects of water supply, water power and sewerage are covered in detail. The methods of collecting, purifying and distributing water are explained and compared; housedrainage, the design of sewerage systems and the disposal of sewage also receive attention. Computations for dams, standpipes, sewers and other appurtenances are made. Canal engineering, river and harbor work and land drainage are studied; irrigation by both water and sewage are discussed. This training in Hydraulics and Sanitary Engineering subjects, including Sanitary Biology of the Senior year, is planned to enable a graduate to enter upon the work of city engineering. In connection with the course in Hydraulics, measurements are made of the flow in the Lehigh River, the Lehigh Canal and other streams in the vicinity of Bethlehem and the data thus obtained are studied later and reports written thereon. In view of the increasing importance of water power development this work is of value and interest.

The contents of the courses in Highway Engineering and Railroads are planned to prepare a student to enter the field of highway construction and design, and railroad work.

Contracts and Specifications of the second term of the Senior year is presented by the Civil Engineering Department more from the engineering than from the legal viewpoint. This course, consisting of two lectures a week, gives the essential features of contracts and the form and scope of contracts and specifications as used in building engineering works.

A description of the Fritz Engineering Laboratory which is operated by the Civil Engineering Department is given in this Register under the heading of Buildings.

The student who completes the course receives the degree of Civil Engineer (C.E.). Mature young men, if properly qualified, may take special studies without being candidates for the degree.

THE COURSE IN CIVIL ENGINEERING

FRESHMAN YEAR

FIRST TERM

	N	C	R	P	T
Adv. Algebra	143	(4)	4	8	12
Chemistry	390 or 393	(2)	2	4	6
Chem. Lab.	391or393a	(2)	6	0	6
El. Mechanics	320	(3)	3	5	8
French	94				
or German	75	(3)	3	6	9
or Spanish	111				
English	120	(2)	2	2	4
M.S. & P.E.	470, 500	(2)	4	2	6
		18	24	27	51

SECOND TERM

	N	C	R	P	T
P. Anal. Geom.	145	(3)	3	6	9
Qual. Anal.	395	(2)	6	1	7
Stoichiometry	397	(1)	1	1	2
El. Mechanics	321	(3)	3	4	7
Phys. Measure	322	(1)	3	2	5
French	94				
or German	75	(3)	3	5	8
or Spanish	111				
English	122	(2)	2	2	4
Drawing	162	(1)	3	0	3
M.S. & P.E.	470, 500	(2)	4	2	6
		18	28	23	51

SUMMER TERM: R. O. T. C. Camp, with report, 470a, 6 weeks (3)

SOPHOMORE YEAR

FIRST TERM

	N	C	R	P	T
Cal. & S.A.Geom.	146	(4)	4	8	12
Elec. & Mag.	323	(3)	3	4	7
M. & H. Lab.	324	(1)	2	1	3
Mineralogy	266	(4)	6	3	9
Heat Eng.	221	(3)	3	6	9
Engr. Drawing	163	(3)	7	1	8
M.S. & P.E.	471, 500	(2)	4	2	6
		20	29	25	54

SECOND TERM

	N	C	R	P	T
Int. Calculus	147	(4)	4	8	12
Light & Sound	325	(3)	3	4	7
L., E. & M. Lab.	326	(1)	2	1	3
Gen. Geology	268	(2)	2	3	5
Geol. Lab.	269	(2)	4	3	7
Heat Eng.	222	(3)	3	6	9
Engr. Drawing	164	(2)	5	0	5
M.S. & P.E.	471, 500	(2)	4	2	6
		19	27	27	54

SUMMER TERM: Land and Topographic Surveying, 165, 3 weeks (1½); Railroad Surveying, 166, 2 weeks (1½)

JUNIOR YEAR

FIRST TERM

	N	C	R	P	T
Str. of Mat.	167	(4)	4	8	12
Str. Mat. Lab.	168	(1)	3	0	3
Anal. Mech.	149	(2)	2	4	6
Railroads	169	(4)	8	2	10
Metallurgy	247	(3)	3	4	7
Dyn. & Mot.	354	(2)	2	4	6
Dyn. Lab.	355	(1)	3	1	4
Physical Ed.	500	(1)	2	0	2
		18	27	23	50

SECOND TERM

	N	C	R	P	T
Hydraulics	170	(3)	3	6	9
Hyd. Lab.	171	(1)	3	0	3
Roofs & Bridges	172	(4)	4	8	12
Astronomy	150	(3)	3	6	9
Alt. Cur.	375	(2)	2	4	6
Dyn. Lab.	356	(1)	3	1	4
Highway Engr.	173	(3)	5	2	7
Physical Ed.	500	(1)	2	0	2
		18	25	27	52

SUMMER TERM: Shop Work or Engineering Construction, with report, 187, 8 weeks (3)

SENIOR YEAR

FIRST TERM

	N	C	R	P	T
Str. Steel Des.	175	(3)	3	6	9
Br. Des. Dr.	177	(3)	9	0	9
Hyd.& W.P. Engr.	179	(4)	5	7	12
Geodesy	180	(3)	6	2	8
or Pract. Astr.	151	(3)	3	6	9
Bus. Engr	30a	(3)	3	3	6
R. R.s & Ter.	181	(3)	3	3	6
Physical Ed.	500	(1)	2	0	2
		20	31	21	52

SECOND TERM

	N	C	R	P	T
Higher Structures	182	(3)	3	6	9
R. Con. D. & F.	183	(3)	3	6	9
Cement Lab.	184	(1)	3	0	3
San. Engr.	186	(3)	3	6	9
San. Biol.	295	(2)	3	5	8
English	137	(3)	3	3	6
or Con. & Spec.	185	(2)	2	4	6
Bus. Engr.	30a	(3)	3	3	6
Physical Ed.	500	(1)	2	0	2
		19	23	29	52

Figures under letters above indicate the following: N, course numbers in Register; C, number of credit hours a week; R, number of clock hours a week in class; P, average number of clock hours a week in outside work and preparation; T, total number of hours a week.

THE COURSE IN MECHANICAL ENGINEERING

The requirements for admission to the Course in Mechanical Engineering are given on page 19.

The purpose of this course is to give young men a broad and thorough training in the fundamental subjects which underlie all engineering.

The Freshman year is given to fundamental studies in preparation for the technical work of the following years and to studies of general cultural value. The former comprise Advanced Algebra, Analytic Geometry, Elementary Chemistry with laboratory exercises, Qualitative Analysis, Stoichiometry, Elementary Mechanics, Heat, and laboratory work in Physical Measurements. The general studies are English, Military Science and Tactics, and modern languages,—French, German or Spanish. Students continue the language accepted for entrance.

At the close of the Freshman year, students attend the R. O. T. C. encampment for six weeks and hand in a report on the work at the beginning of the Sophomore year.

In the Sophomore year the following courses are given: Differential Calculus, Solid Analytic Geometry, Integral Calculus, Electricity and Magnetism, Light and Sound, Mechanism, Mechanical Drawing, Elementary Machine Design, and Steam Engines. The laboratory course covers mechanics, heat, light, electricity and magnetism. Military Science and Tactics is continued.

At the close of the Sophomore year students are required to spend eight weeks in an industrial plant and hand in a report at the beginning of the Junior year.

The courses given in the Junior year are Differential Equations, Analytic Mechanics, Strength of Materials, Graphic Statics of Mechanisms, Advanced Electricity and Magnetism, Heat Engines, Hydraulics, Metallurgy, Graphic Statics of Structures and Dynamos and Motors. Courses are given in Engineering Laboratory and Electrical Laboratory; laboratory courses also accompany the study of Strength of Materials and Hydraulics.

At the close of the Junior year students are required to spend at least eight weeks on student apprenticeship work, shop work, or engineering construction as approved by the Department. A report is required.

The courses of the Senior year are Machine Design, Alternating Currents and Electrical Engineering, both accompanied by laboratory work, Mechanical Engineering, English, Business Engineering and Engineering Laboratory. A thesis is required.

The course in Mechanical Engineering is built upon the work of the Sophomore and Junior years and consists of Thermodynamics, Steam Turbines, Internal Combustion Engines, Air Machinery, Pumping Machinery and Refrigeration.

The course in Business Engineering comprises the elements of Economics, Accounting, Business Law and Finance.

Instruction in Machine Design is given throughout the Sophomore year. There is a thorough drill in projection drawing. Freehand sketches are first made and measurements taken of machine pieces; these sketches are then converted into full-sized drawings. There is then considerable practice in the interpretation of such drawings. This is followed by difficult projections and intersections and exercises in the proportioning of machine parts. Both empirical and rational formulas are used to determine the dimensions of fastenings, bearings, rotating and sliding pieces, belt and toothed gearing, levers and connecting rods, the data being given as they would arise in practice. In their Senior year the students undertake the calculations, estimates and working drawings involved in the design of simple but complete machines, the general plan of arrangement being given in the form of rough sketches, photographs or wood cuts. In the second term the Seniors make original designs for simple machinery.

After completing the general course in Physics, students in Mechanical Engineering take courses along electrical lines. The aim is a clear conception of electrical units and a working knowledge of resistance, impedance, reactance, capacity, the magnetism of iron and the magnetic circuit as used in the construction of electrical machinery. Attention is then directed to the theory and calculation of direct current dynamos, to the study of variable and alternating current phenomena and to the theory of the alternating current apparatus. Practical problems show their application. The laboratory work involves tests of resistance, insulation, consumption of energy and efficiency.

The course in Engineering Laboratory begins with the handling and calibration of the instruments and appliances belonging to the experimental side of mechanical engineering. The simpler tests and experiments are taken up next, and there is a gradual progress toward complex operations such as the complete test of a power plant or pumping station, or a full thermodynamic test of the steam engine. The course is, at present, most fully developed in the field of steam engineering, where it embraces steam calorimetry, flow of steam, the testing of steam traps and separators; of injectors, pumps, and the steam turbine; extensive practice with the indicator, engine tests of various sorts and boiler testing.

Due place is given in the course to gas engineering, tests of gas producers, gas engines and oil engines, work with compressed air, tests of hot-air engines and various incidental appliances and apparatus. Dynamometer work includes experiments in friction and lubrication and determination of the efficiency of machines. The purpose of this course is to provide a system of well-selected and graded experiments which will illustrate and impress principles, develop the skill and judgment of the student and give training in the idea, method and detail of this sort of work.

In the Senior year one or two trips are made to New York or Philadelphia during which visits of inspection are made to power plants, municipal works, ship yards and a variety of industrial plants located in these cities or vicinity.

Graduates of this course receive the degree of Mechanical Engineer (M.E.).

THE COURSE IN MECHANICAL ENGINEERING

FRESHMAN YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Adv. Algebra	143	(4)	4	8	12	P. Anal. Geom.	145	(3)	3	6	9
Chemistry	.390 or 393	(2)	2	4	6	Qual. Anal.	395	(3)	9	1	10
Chem. Lab.	391or393a	(2)	6	0	6	Stoichiometry	397	(1)	1	1	2
El. Mechanics	320	(3)	3	5	8	El. Mechanics	321	(3)	3	4	7
French or German or Spanish	94 75 111	(3)	3	6	9	Phys. Measure	322	(1)	3	2	5
English	120	(2)	2	2	4	French or German or Spanish	94 75 111	(3)	3	5	8
M.S. & P.E.	470, 500	(2)	4	2	6	English	122	(2)	2	2	4
						M.S. & P.E.	470, 500	(2)	4	2	6
		18	24	27	51			18	28	23	51

SUMMER TERM: R. O. T. C. Camp, with report, 470a, 6 weeks (3)

SOPHOMORE YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Cal. & S.A.Geom.	146	(4)	4	8	12	Int. Calculus	147	(4)	4	8	12
Elec. & Mag.	323	(3)	3	4	7	Light & Sound	325	(3)	3	4	7
M. & H. Lab.	324	(1)	2	1	3	L., E. & M. Lab.	326	(1)	2	1	3
Dr. and El.M.Des.	200	(3)	3	6	9	El. Mach. Des.	203	(3)	3	6	9
Heat Eng.	201	(3)	3	6	9	Heat Eng.	204	(3)	3	6	9
Mechanism	202	(3)	3	5	8	Mechanism	205	(3)	3	5	8
M.S. & P.E.	471, 500	(2)	4	2	6	M.S. & P.E.	471, 500	(2)	4	2	6
		19	22	32	54			19	22	32	54

SUMMER TERM: Work in Industrial Plant, with report, 227, 8 weeks (3)

JUNIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Diff. Equations	148	(1)	1	3	4	Metallurgy	247	(3)	3	4	7
Anal. Mech.	149	(2)	2	4	6	Hydraulics	170a	(2)	2	4	6
Str. of Mat.	167a	(3)	3	6	9	Hyd. Lab.	171	(1)	3	0	3
Str. Mat. Lab.	168	(1)	3	0	3	Gr. St. & Surv.	174	(3)	3	6	9
Gr. St. of Mech.	206	(2)	4	0	4	Dyn. & Mot.	354	(2)	2	4	6
Adv. Elec. & Mag.	327	(2)	2	4	6	Elec. Lab.	329	(1)	3	1	4
Elec. Lab.	328	(1)	3	0	3	Heat Eng.	209	(4)	4	8	12
Heat Eng.	207	(4)	4	8	12	Engr. Lab.	210	(1)	3	0	3
Engr. Lab.	208	(1)	3	0	3	Physical Ed.	500	(1)	2	0	2
Physical Ed.	500	(1)	2	0	2			18	25	27	52
		18	27	25	52						

SUMMER TERM: Student Apprenticeship or Engineering Construction or Shop Work, with report, 228, 8 weeks (3)

SENIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
English	123, 125	(3)	3	3	6	Mach. Design	215	(4)	4	8	12
Mach. Design	211	(4)	4	8	12	Elec. Engr.	361	(2)	2	4	6
Alt. Currents	375	(2)	2	4	6	Dyn. Lab.	356	(1)	3	1	4
Dyn. Lab.	355	(1)	3	1	4	Bus. Engr.	30a	(3)	3	3	6
Bus. Engr.	30a	(3)	3	3	6	Mech. Engr.	216	(4)	4	8	12
Mech. Engr.	212	(4)	4	8	12	Engr. Lab.	217	(1)	3	0	3
Engr. Lab.	213	(1)	3	0	3	Thesis	214	(3)	1	6	7
Physical Ed.	500	(1)	2	0	2	Physical Ed.	500	(1)	2	0	2
		19	24	27	51			19	22	30	52

Figures under letters above indicate the following: N, course numbers in Register; C, number of credit hours a week; R, number of clock hours a week in class; P, average number of clock hours a week in outside work and preparation; T, total number of hours a week.

THE COURSE IN METALLURGY

The requirements for admission to the Course in Metallurgy are given on page 19.

The object of this course is the preparation of the student for practice in the general field of metallurgy. It is recognized that the breadth of the subject is such that detailed instruction in any particular subdivision is precluded in the time limits imposed by a four-year's course. Emphasis is therefore laid on the more thorough training of the student in fundamentals. It is a fairly simple matter for a man thoroughly grounded in fundamental theory to make the necessary applications to actual practice after he gets into the field, but the acquisition of theory to bolster up a purely practical knowledge is a more difficult proposition.

The foundation of any engineering course must be a thorough training in mathematics, chemistry and physics, and every effort is made to have the work along these lines as full as the time available will permit. A large portion of the first two years of the course is occupied by these subjects, while the last two years are taken up mainly by the application of these in the various technical subjects.

Collateral studies in other departments than metallurgy are liberally provided, such as Mineralogy, Blowpiping, General Geology, Geological Practice and Economic Geology in the Department of Geology; Mechanical Drawing and Ore Dressing in the Department of Mining Engineering; Advanced Electricity and Magnetism and Electrical Laboratory in the Department of Physics; Alternating Currents, Dynamos and Motors, Electrical Engineering and Dynamo Laboratory in the Department of Electrical Engineering; Heat Engines, comprising the study of boilers, steam engines, gas engines and internal combustion motors, and Engineering Laboratory, in the Department of Mechanical Engineering; Hydraulics and Strength of Materials, with laboratory testing, in the Department of Civil Engineering.

Instruction is given in English composition, writing and public speaking. The study of German or French for one year is required, the student continuing the language on which he enters; if a student enters with Spanish he takes one year of German. The one year of either German or French is supplemented in the Senior year by a brief but intensive course in the grammar of the other language, and by readings in Metallurgical German and French with the staff of the Department of Metallurgy.

The studies in chemistry, which are so important to the metallurgist, include Laboratory Experiments, Qualitative and Quantitative Analysis, both gravimetric and volumetric, of the more common ores and metallurgical products, including Gas Analysis and Assaying, along with courses in Stoichiometry, Advanced Chemistry, Physical Chemistry and Physical Chemistry Laboratory. This instruction, together with the course in Physics and Physical Laboratory, constitutes the foundation on which the metallurgical instruction is based.

The special instruction in Metallurgy is begun by introductory courses of lectures on the history of the metals, followed by a discussion of their economic and mechanical importance, their physical and chemical properties, including statistics of their production and details of the distribution of their ores and the geographical distribution and conditions of their production. Courses of lectures extending over two years take up in detail the general principles of metallurgy and their applications to specific cases. They begin with the general physical and chemical principles utilized in extracting metals from their ores and the manner in which they are applied, and are followed by a course of lectures on the Metallurgy of Iron and Steel, and by another course in the Metallurgy of the other metals, copper, lead, silver, gold, etc., in which each metal is discussed in detail. In order to impress these principles upon the student and to render their application familiar, he is required to solve a series of problems dealing with practical details of the metallurgical processes in an exact and quantitative manner, the data being taken from every-day commercial practice so that the results may give an insight into the quantitative relations that are fundamental to all metallurgical processes. A course of lectures follows this in the principles of electrochemistry, and their application in electrometallurgy, accompanied by laboratory investigations of these principles as well as the general principles of metallurgical processes, including methods of making physical and chemical measurements which are of value to the practicing metallurgist. A course in Metallography acquaints the student with the methods of studying with the microscope and other instruments of precision, the physical properties, constitution and structure of metals and alloys. The seminary in the Senior year is intended to bring together the members of the Department and the students in the discussion of current metallurgical questions and problems, and students' theses.

The proximity of the works of the Bethlehem Steel Company and the kindness of its officers give opportunity for visits of inspection by the students in classes and individually, thus affording unusual facilities for the practical study of the metallurgy of iron and steel. Occasional visits of inspection are made to more distant works, in connection with the metallurgy of zinc, copper, lead, gold and silver.

Graduates of this course receive the degree of Metallurgical Engineer (Met.E.).

THE COURSE IN METALLURGY

FRESHMAN YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Adv. Algebra	143	(4)	4	8	12	P. Anal. Geom.	145	(3)	3	6	9
Chemistry	390 or 393	(2)	2	4	6	Qual. Anal.	395	(3)	9	0	9
Chem. Lab.	391or393a	(2)	6	0	6	Qual. An. Conf.	396	(1)	1	2	3
El. Mechanics	320	(3)	3	5	8	Stoichiometry	397	(1)	1	1	2
German or French	72 or 76 94	(3)	3	6	9	Hist. Metals	241	(1)	1	1	2
English	120	(2)	2	2	4	El. Mechanics	321	(3)	3	4	7
M.S. & P.E.	470, 500	(2)	4	2	6	Phys. Measure	322	(1)	3	2	5
						German or French	72 or 76 94	(3)	3	5	8
		18	24	27	51	M.S. & P.E.	470, 500	(2)	4	2	6
								18	28	23	51

SUMMER TERM: R. O. T. C. Camp, with report, 470a, 6 weeks (3)

SOPHOMORE YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Cal. & S.A.Geom.	146	(4)	4	8	12	Int. Calculus	147	(4)	4	8	12
Adv. Chem.	398	(3)	3	3	6	Adv. Chem.	399	(3)	3	6	9
Elec. & Mag.	323	(3)	3	4	7	Light & Sound	325	(3)	3	4	7
M. & H. Lab.	324	(1)	2	1	3	L., E. & M. Lab.	326	(1)	2	1	3
Intro. Met	242	(1)	1	1	2	Intro. Met	242	(1)	1	1	2
Drawing	300	(2)	6	0	6	Gen. Geology	268	(2)	2	3	5
Mineralogy	266	(4)	6	3	9	Geol. Lab.	269	(2)	4	3	7
B. P. Anal.	267	(1)	3	0	3	B. P. Anal.	267	(1)	3	0	3
M.S. & P.E.	471, 500	(2)	4	2	6	M.S. & P.E.	471, 500	(2)	4	2	6
		21	32	22	54			19	26	28	54

SUMMER TERM: Quantitative Analysis, 403a, 5 weeks (3)

JUNIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
G.Met.&Probs.	243,244	(3)	3	4	7	I.&S. & Probs.	245,246	(3)	3	4	7
Phys. Chem.	419	(3)	3	3	6	Phys. Chem.	421	(2)	2	3	5
Ore Dr. & Lab.	302	(3)	3	3	6	Dyn. & Mot.	354	(2)	2	3	5
Adv. Elec. & Mag.	327	(2)	2	4	6	Dyn. Lab.	355	(1)	3	1	4
Elec. Lab.	328	(1)	3	0	3	Elec. Lab.	329	(1)	3	0	3
Heat Eng.	221	(3)	3	6	9	Heat Eng.	222	(3)	3	6	9
Str. of Mat.	167a	(3)	3	6	9	Hydraulics	170a	(2)	2	4	6
Str. Mat. Lab.	168	(1)	3	0	3	Hyd. Lab.	171	(1)	3	0	3
Physical Ed.	500	(1)	2	0	2	English	125, 127	(4)	4	4	8
						Physical Ed.	500	(1)	2	0	2
		20	25	26	51						
								20	27	25	52

SUMMER TERM: Assaying, 413, 4 weeks (3)

SENIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
N.F. Met.&Pr.	248,249	(3)	3	4	7	N.F. Met.&Pr.	250,251	(3)	3	4	7
Metallography	257	(3)	7	1	8	Met. Lab.	256	(2)	4	2	6
El. Chem.	252	(1)	1	2	3	El. Met.	253	(1)	1	2	3
El. Chem. Lab.	255	(1)	2	1	3	Seminary	258	(2)	3	0	3
Seminary	258	(3)	4	2	6	Elec. Engr.	361	(2)	2	3	5
Alt. Currents	375	(2)	2	3	5	Dyn. Lab.	362	(1)	3	1	4
Dyn. Lab.	356	(1)	3	1	4	Eng. Lab.	226	(1)	3	0	3
Phys. Chem. Lab	420	(1)	3	0	3	Econ. Geol.	271	(4)	5	5	10
Engr. Lab.	220	(1)	3	0	3	Thesis	259	(3)	1	8	9
French or Ger.	91 or 72	(3)	3	5	8	Physical Ed.	500	(1)	2	0	2
Physical Ed.	500	(1)	2	0	2			20	27	25	52
		20	33	19	52						

Figures under letters above indicate the following: N, course numbers in Register; C, number of credit hours a week; R, number of clock hours a week in class; P, average number of clock hours a week in outside work and preparation; T, total number of hours a week.

THE COURSE IN MINING ENGINEERING

The requirements for admission to the Course in Mining Engineering are given on page 19.

The object of this course is primarily to train a student for practice in the field of mining engineering. It is designed to give him the thorough fundamental training of an engineer and a breadth of education that will enable him readily to undertake work in the various lines of engineering frequently presented to one of his profession.

The course, therefore, places the graduate in the path of a large number of opportunities. Not only will he have had sufficient practice and training to enter upon the field of mining, but he can pursue work in which geology and metallurgy play an important part, and also in related engineering projects.

In the Freshman year a foundation is laid in the fundamental subjects of mathematics, physics, chemistry, English and modern foreign languages. The modern language pursued is the one presented for entrance. Lectures are given in physiology and hygiene, also in military science and tactics. Military drill and systematic physical exercise are required. Students attend the R. O. T. C. camp at the close of the Freshman year.

The course in Drawing begins in the second term of the Freshman year. A student learns the use of drawing instruments, making tracings and blue prints, drawings of machine parts of simple construction, and solves problems in Descriptive Geometry.

The summer schools in Land and Topographic Surveying and in Mine and Railroad Surveying are held at the close of the Junior year. The second of these schools is conducted partly in the mining regions; this gives practice in mine and railroad surveying and permits a study of mining operation and mining plants, from which data are secured exemplifying class room work and facilitating the course in Mining Design of the Senior year.

The course in Chemistry begins in the first term of the Freshman year and extends to the end of the Sophomore year, with the summer school in Assaying at the end of that year. Beginning with an introduction to general chemical theory and the elements, supplemented by laboratory work, the subject is continued by Qualitative and Quantitative Analysis. Chemical problems and reactions are taught in Stoichiometry. The instruction includes the analysis of common ores, fuels, gases and metallurgical products.

The course in Business Engineering in the Senior year aims to present to the student the several economic, commercial, administrative and legal aspects of conditions existing in the industrial world which are of particular concern to the engineering profession.

The importance of the conservation of the timber resources of the country and the preservation of wood against decay are treated in Forestry, together with the characteristics of the woods of the important timber species.

Mineralogy is introduced by a short course in Crystallography, in which models of crystals and mineral specimens are studied. The various means of identification are then applied to more difficult minerals, the determination of which may be assisted and effected by the work in Blowpipe Analysis.

In the courses in Geology, the student studies the forms and structures of the rock masses of the earth's crust, and the forces which modify them. A brief review of historical geology deals with the fossil life of the globe. Practice in Field Geology teaches the methods by which rock formations are accurately mapped. Economic Geology treats of the origin, mode of occurrence and distribution of the metallic and non-metallic minerals and substances of commercial value in the earth. The course in Petrography enables the student to identify the common rock-forming minerals by the use of the microscope, especially when the constituents are too fine-grained to be determined by the eye alone. Practice in the petrographic and geological laboratory and in the field qualifies the student to recognize the main types of rocks.

Physiography treats of the classification of land forms and their geographical distribution, their relation to geologic structure, weather and climate, and their influence upon the economic development of countries. The course in Geology of North America discusses the geologic ages and the geographic distribution of the rocks of the continent, their structure and history, and includes studies of the great surveys that have been made. Paleontology reviews the life of past ages and involves the study and identification of fossils as a means of determining the age of rocks by the principles of stratigraphy.

The course in Heat Engines includes a practical study of boilers, steam and gas engines and steam turbines; work in the Wilbur Engineering Laboratory includes tests and calculations of efficiencies and powers under varying conditions.

Strength of Materials treats of the theories which govern the strength of all kinds of common materials used in construction. Practice is given in computing and designing beams, columns, girders, etc. Hydraulics deals with the flow of liquids through orifices, mains, pipes and channels, and with the principles of hydraulic motors; practical work in the Fritz Engineering Laboratory is a part of this course. Graphic Statics qualifies the student to compute the forces developed in roof trusses, bridges and girders by the methods of graphical analysis.

The instruction in Mining Engineering is given during the Junior and Senior years, under the following subdivisions: prospecting, boring, mining or exploitation, haulage, hoisting, drainage, ventilation, lighting, first-aid, railroads, construction materials and mine administration. These subjects treat successively of the steps by which minerals are discovered and valued, the manner in which they are extracted from the earth and brought to the surface, the manner in which accidents may occur and means for guarding against them, and the treatment of injured persons, and the means by which mines are maintained in an economical condition from the viewpoint of mine owner and miner.

The subject of Ore Dressing, supplemented by work in the Coxe Mining Laboratory, deals with the processes by which ores and fuels, direct from the mine, are rendered marketable. Construction Materials treats of the materials used in roads and structures in and around mines, particular attention being given to the use of reinforced concrete construction. Mine Administration discusses the method of employing labor and of keeping accounts, mining principles and management.

The course in Oil and Gas Technology includes a study of the occurrence and distribution of petroleum and natural gas, the methods of prospecting, the means for obtaining them from the earth, and their storage and transportation.

In Mining Design the student employs principles studied and observations made as the basis for designs and working drawings of parts of mining plant to fulfill given conditions.

In Metallurgy the general principles of the subject embracing fuels, furnaces and processes, are presented, followed by the metallurgy of iron and steel, copper, lead, gold, silver, zinc, tin, mercury, nickel and aluminium. Electrochemistry and Electrometallurgy familiarize the student with the practical applications of electricity to metallurgical processes including electric-furnace practice. Visits of inspection are made to metallurgical plants in the vicinity, and also to those near New York City.

Dynamos and Motors and Alternating Currents extend over the entire Senior year and embrace the study of the industrial applications of electricity which are of particular value to the mining engineer; practical work in the Dynamo Laboratory is included in these courses.

It may thus be observed that the student of the Course in Mining Engineering has studies in all of the technical departments of the University, as well as in many of the arts and science departments.

The facilities for exemplifying the work of the course are exceptional. Cement mills, cement, slate and other quarries, ore and coal mines are within easy distance and in the city are the great works of the Bethlehem Steel Company. During the Junior and Senior years all students in Mining Engineering are required to make inspection trips to the anthracite coal regions and to the metal mining districts of eastern Pennsylvania and of New Jersey. A voluntary inspection trip to the mines of the central northern part of the United States and southern Ontario last summer included the Lake Superior iron and copper region.

The Department of Mining Engineering has exceptional facilities in the Eckley B. Coxe Mining Laboratory. A description of the Laboratory is given on pages 159-160 of this Register.

Graduates of this course receive the degree of Engineer of Mines (E.M.).

THE COURSE IN MINING ENGINEERING

FRESHMAN YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Adv. Algebra	143	(4)	4	8	12	P. Anal. Geom.	145	(3)	3	6	9
Chemistry	390 or 393	(2)	2	4	6	Qual. Anal.	395	(3)	9	1	10
Chem. Lab.	391or393a	(2)	6	0	6	Stoichiometry	397	(1)	1	1	2
El. Mechanics	320	(3)	3	5	8	El. Mechanics	321	(3)	3	4	7
French	94	(3)	3	6	9	Phys. Measure	322	(1)	3	2	5
or German	75					French	94	(3)	3	5	8
or Spanish	111					or German	75				
English	120	(2)	2	2	4	or Spanish	111				
M.S. & P.E.	470, 500	(2)	4	2	6	Drawing	300	(2)	4	0	4
						M.S. & P.E.	470, 500	(2)	4	2	6
		18	24	27	51			18	30	21	51

SUMMER TERM: R. O. T. C. Camp, with report, 470a, 6 weeks (3)

SOPHOMORE YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Cal. & S.A.Geom.	146	(4)	4	8	12	Int. Calculus	147	(4)	4	8	12
Quant. Anal.	401	(3)	9	0	9	Quant. Anal.	403	(3)	9	0	9
Quant. An. Conf.	402	(1)	1	1	2	Quant. An. Conf.	405	(1)	1	1	2
Elec. & Mag.	323	(3)	3	4	7	Light & Sound	325	(3)	3	4	7
M. & H. Lab.	324	(1)	2	1	3	L., E. & M. Lab.	326	(1)	2	1	3
Mineralogy	266	(4)	6	3	9	Gen. Geology	268	(2)	2	3	5
B. P. Anal.	267	(1)	3	0	3	Geol. Lab.	269	(2)	4	3	7
Drawing	300	(1)	3	0	3	B. P. Anal.	267	(1)	3	0	3
M.S. & P.E.	471, 500	(2)	4	2	6	M.S. & P.E.	471, 500	(2)	4	2	6
		20	35	19	54			19	32	22	54

SUMMER TERM: Assaying, 413, 4 weeks (3)

JUNIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Mining Engr.	301	(4)	4	4	8	Mining Engr.	303	(4)	4	4	8
Ore Dr. & Lab.	302	(3)	3	3	6	Metallurgy	247	(3)	3	4	7
Str. of Mat.	167	(4)	4	8	12	Heat Eng.	222	(3)	3	6	9
Heat Eng.	221	(3)	3	6	9	Hydraulics	170	(3)	3	6	9
Petrography	276	(2)	3	2	5	Hyd. Lab.	171	(1)	3	0	3
Econ. Geol.	270	(2)	2	3	5	Physiography	274	(2)	2	2	4
Forestry	291	(2)	3	2	5	Oil & Gas Tech.	306	(2)	2	2	4
Physical Ed.	500	(1)	2	0	2	English	127	(2)	2	4	6
						Physical Ed.	500	(1)	2	0	2
		21	24	28	52			21	24	28	52

SUMMER TERM: Land and Topographic Surveying, 165, 3 weeks (1½);
Mine and Railroad Surveying, 304, 3 weeks (1½)

SENIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Mining Engr.	305	(3)	3	3	6	Mining Des.	307	(3)	6	1	7
N. F. Met.	248	(2)	2	2	4	Econ. Geol.	271	(4)	5	5	10
El. Chem. & Met.	254	(2)	2	3	5	N. F. Met.	250	(2)	2	2	4
Dyn. & Mot.	354	(2)	2	4	6	Alt. Cur.	375	(2)	2	4	6
Dyn. Lab.	355	(1)	3	1	4	Dyn. Lab.	356	(1)	3	1	4
Field Geol.	275	(3)	7	3	10	Geol. N. A.	273	(3)	5	2	7
Graph. Stat.	178	(2)	4	2	6	Engr. Lab.	226	(1)	3	0	3
Engr. Lab.	220	(1)	3	0	3	Mine Ad.	305	(1)	1	2	3
Bus. Engr.	30a	(3)	3	3	6	Bus. Engr.	30a	(3)	3	3	6
Physical Ed.	500	(1)	2	0	2	Physical Ed.	500	(1)	2	0	2
		20	31	21	52			21	32	20	52

Figures under letters above indicate the following: N, course numbers in Register; C, number of credit hours a week; R, number of clock hours a week in class; P, average number of clock hours a week in outside work and preparation; T, total number of hours a week.

THE COURSE IN ELECTRICAL ENGINEERING

The requirements for admission to the Course in Electrical Engineering are given on page 19.

The object of this course is to give a broad education in those general and scientific subjects which underlie all the branches of engineering, and to give special training in those technical and business subjects which experience shows are most essential in the equipment of the electrical engineer. In seeking to accomplish this object the Department puts chief emphasis upon mastery of principles and thoroughness in the analysis of problems.

The course includes a number of special studies in civil, mechanical and metallurgical engineering, so that the graduate in Electrical Engineering is prepared not only to enter any of the branches of electrical engineering but also to deal with related problems in the other branches of engineering. The electrical engineering graduate of today finds that professional advancement often lies through commercial, managerial or executive channels. As superintendent or manager of electric light, power or railway properties he must be prepared to handle problems involving not merely material and technical details but human relations, touching workmen, capitalists, public utility commissioners, and the public. He must know something of the principles of accounting, economics, business law and industrial management. A number of such studies have been introduced into the course.

The fundamental studies are given in the early part of the course and include mathematics, physics, chemistry, English and that modern language accepted for entrance. These subjects include the more essential features of a broad education and they furnish a preparation for the more advanced scientific and technical training to follow.

At the close of the Freshman year, students attend the R. O. T. C. Encampment for six weeks and hand in a report on the work at the beginning of the Sophomore year.

Work in applied electricity is pursued through the Sophomore year in the study of Electric Distribution, and Dynamos and Motors, with Dynamo Laboratory. The Junior and Senior years are devoted almost exclusively to advanced technical work.

During each of the vacations following the Sophomore and Junior years students are required to spend at least eight weeks in an electrical industrial plant or station and hand in a written report thereon at the beginning of the next college year.

The study of Electricity and Magnetism constitutes an introduction to the industrial applications of electricity. Electric Distribution makes immediate application of electrical theory to the calculation of lighting and power circuits, the testing of insulation resistance and similar problems. The study also includes the installation and wiring of electrical machinery, systems of electrical distribution, outside and interior wiring.

The study of Dynamos and Motors includes the construction, operation and control of direct current generators and motors, with numerous illustrative problems. The study of dynamo electric machinery is resumed during the Senior year in connection with the subjects Electrical Design and Alternating Current Machinery.

Fundamental subjects in mechanical engineering are required in this course. Machine Design is given throughout the Sophomore year. Graphic Statics of Mechanisms deals with graphic methods of determining the forces acting at all points of a machine and with the efficiency of mechanisms. Heat Engines includes the study of steam boilers, thermodynamics, steam engines, turbines, and gas engines. Engineering Laboratory is given throughout the Senior year.

Important studies in Civil Engineering are included in this course. Strength of Materials is concerned with the theory of beams, columns and shafts, and the method of computing and designing them; the subject includes practical work in the testing laboratory. Hydraulics, including laboratory practice, treats of hydrostatics and theoretical hydraulics, the flow of water through orifices, weirs, pipes and channels, naval hydromechanics and hydraulic motors.

The study of General Metallurgy, Metallurgy of Iron and Steel and Metallurgical Problems is given during the first term of the Sophomore year. Lectures on Electrochemistry and Electrometallurgy are given during the Senior year.

Advanced studies in Electrical Engineering follow Electric Distribution, Dynamos and Motors, and Electricity and Magnetism of the Sophomore year. Advanced Theory of Electricity and Magnetism is devoted to the theory of electrical units and measurements, ferromagnetism, electromagnetism, and advanced theory of electrostatics, electric oscillations and waves, electron theory and electrolysis. The accompanying laboratory work is devoted to precise electrical measurements and the standardization and calibration of electrical measuring instruments. The Theory of Alternating Currents deals with the problems and methods of measurements which are peculiar to the modern practical applications of alternating currents and with the theory underlying the action of the important types of alternating current machinery and transmission lines. Alternating Current Machinery includes the study of the construction and operation of alternating current generators, motors, transformers and other apparatus.

The subject of Electrical Engineering deals with the application of physical principles to the solution of problems relating to direct and alternating current circuits and apparatus.

Dynamo laboratory work, beginning in the second term of the Sophomore year, is continued for five terms. Instruction is based on a laboratory manual or notes supplemented by individual direction and supervision in the laboratory. The students work individually or in pairs, and make the more important tests on direct and alternating current generators and motors, rotary converters, transformers and other electrical apparatus. Written reports of all tests made, with curves plotted from the observations and discussion of results, are required. Throughout these courses the student is trained not only to perform the experimental work but also to plan and direct it.

Electrical Design, begun in the first term of the Senior year, is pursued throughout the year. It includes the application of electric, magnetic and mechanical principles to the design of various types of electrical apparatus. The instruction is given by recitations, problems and drafting.

Electrical Engineering Seminary continues throughout the Senior year. The work consists of the presentation before the class of papers on assigned topics, supplementing the regular work of the class-room and of reports on thesis work. The Department reading-room is well supplied with the leading electrical periodicals, American and foreign. One of the principal objects of the Seminary work is to encourage the systematic reading of the current engineering journals.

Dynamo Testing, given by lectures and problems, treats of standard and special methods of making tests on dynamo machines, transformers and other electrical apparatus.

Electric Stations takes up the location, design and equipment of stations, the selection of suitable prime movers, generators, switchboards and other apparatus. The cost of generating electric power, and the various systems of determining rates, receive consideration. Under Electric Traction are studied the construction, equipment and operation of different types of electric railways. The recent developments in the application of electric motive power to steam railroad conditions are discussed and the results of tests are analyzed.

The subject of Electric Power Transmission deals with the various elements constituting a transmission system. It includes a study of the generating plant, the transmission line and the receiving systems. Special attention is given to the design, construction and protection of the line. Under the last three subjects are included visits of inspection to electric light and power stations and manufacturing establishments in Bethlehem and elsewhere. Central station tests are made and reports are required.

Electric Communication deals with telephone and telegraph systems, with special emphasis on matters of radio telegraphy and telephony, including theory and operation of vacuum tube circuits. The laboratory work given in connection with this course includes practical experiments and tests on radio apparatus of various types and the operation of sending and receiving sets.

Graduates of this course receive the degree of Electrical Engineer (E.E.).

THE COURSE IN ELECTRICAL ENGINEERING

FRESHMAN YEAR

FIRST TERM	N	C	R	P	T
Adv. Algebra	143	(4)	4	8	12
Chemistry	.390 or 393	(2)	2	4	6
Chem. Lab.	391or393a	(2)	6	0	6
El. Mechanics	320	(3)	3	5	8
French or German or Spanish	94 75 111	(3)	3	6	9
English	120	(2)	2	2	4
M.S. & P.E.	470, 500	(2)	4	2	6
		18	24	27	51

SECOND TERM	N	C	R	P	T
P. Anal. Geom.	145	(3)	3	6	9
Qual. Anal.	395	(3)	9	1	10
Stoichiometry	397	(1)	1	1	2
El. Mechanics	321	(3)	3	4	7
Phys. Measure	322	(1)	3	2	5
French or German or Spanish	94 75 111	(3)	3	5	8
English	122	(2)	2	2	4
M.S. & P.E.	470, 500	(2)	4	2	6
		18	28	23	51

SUMMER TERM: R. O. T. C. Camp, with report, 470a, 6 weeks (3)

SOPHOMORE YEAR

FIRST TERM	N	C	R	P	T
Cal. & S.A.Geom.	146	(4)	4	8	12
Elec. & Mag.	323	(3)	3	4	7
M. & H. Lab.	324	(1)	2	1	3
Elec. Distribution	351	(2)	2	6	8
Dr. & El. M. Des.	200	(3)	6	3	9
Metallurgy	247	(3)	3	4	7
M.S. & P.E.	471, 500	(2)	4	2	6
		18	24	28	52

SECOND TERM	N	C	R	P	T
Int. Calculus	147	(4)	4	8	12
Light & Sound	325	(3)	3	4	7
L., E. & M. Lab.	326	(1)	2	1	3
Dyn. & Mot.	352	(3)	3	6	9
Dyn. Lab.	353	(1)	3	1	4
El. Mach. Des.	203	(3)	3	6	9
Gr. St. of Mech.	206	(2)	4	0	4
M.S. & P.E.	471, 500	(2)	4	2	6
		19	26	28	54

SUMMER TERM: Work in Electrical Shops or Plant, with report, 376, 8 weeks (3)

JUNIOR YEAR

FIRST TERM	N	C	R	P	T
Diff. Equations	148	(1)	1	3	4
Anal. Mech.	149	(2)	2	4	6
Alt. Currents	357	(3)	3	4	7
Dyn. Lab	358	(1)	3	0	3
Elec. Lab.	328	(1)	3	0	3
Adv. Elec. & Mag.	327	(2)	2	4	6
Str. of Mat.	167a	(3)	3	6	9
Str. Mat. Lab.	168	(1)	3	0	3
Heat Eng.	221	(3)	3	6	9
Physical Ed.	500	(1)	2	0	2
		18	25	27	52

SECOND TERM	N	C	R	P	T
Alt. Cur.	359	(2)	2	4	6
Elec. Engr.	360	(3)	3	6	9
Dyn. Test.	364	(1)	3	0	3
Dyn. Lab.	362	(1)	3	1	4
Elec. Lab.	329	(1)	3	1	4
Hydraulics	170a	(2)	2	4	6
Hyd. Lab.	171	(1)	3	0	3
Heat Eng.	222	(3)	3	6	9
English	127	(3)	3	3	6
Physical Ed.	500	(1)	2	0	2
		18	27	25	52

SUMMER TERM: Work in Electrical Shops or Plant, with report, 376, 8 weeks (3)

SENIOR YEAR

FIRST TERM	N	C	R	P	T
Alt. Cur. Mach.	363	(4)	4	6	10
Dyn. Testing	365	(1)	1	1	2
Dyn. Lab.	366	(3)	6	3	9
Elec. Design	367	(2)	3	3	6
Elec. Stations	368	(2)	2	4	6
El. Chem. & Met.	254	(2)	2	3	5
Engr. Lab.	220	(1)	3	0	3
Elec. Seminary	369	(1)	2	1	3
Bus. Engr.	30a	(3)	3	3	6
Physical Ed.	500	(1)	2	0	2
		20	28	24	52

SECOND TERM	N	C	R	P	T
Elec. Traction or Elec. Com.	371 378	(3)	3	5	8
Elec. Power Tr.	372	(3)	3	5	8
Elec. Design	370	(2)	2	3	5
Dyn. Lab.	374	(2)	6	2	8
Elec. Seminary	373	(1)	2	1	3
Engr. Lab.	226	(1)	3	0	3
Bus. Engr.	30a	(3)	3	3	6
Thesis	377	(3)	8	1	9
Physical Ed.	500	(1)	2	0	2
		19	32	20	52

Figures under letters above indicate the following: N, course numbers in Register; C, number of credit hours a week; R, number of clock hours a week in class; P, average number of clock hours a week in outside work and preparation; T, total number of hours a week.

THE COURSE IN CHEMISTRY

The requirements for admission to the Course in Chemistry are given on page 19.

This course, leading to the degree of Bachelor of Science in Chemistry, offers an education primarily in chemistry, with some training in related sciences. The modern conception of an education in chemistry includes a simultaneous, thorough study of physics and mathematics. In addition to these so-called physical sciences, other studies, planned to develop and aid the thought-processes and culture of the student, are embodied in the course. It is believed by many practicing chemists and chemical engineers that an undergraduate course embracing a liberal allotment of study in the humanities is the best preparation for a successful career. Aside from preparation for the life of a professional chemist, it is well adapted for teachers of chemistry and as a course preliminary to the study of medicine.

This course and the Course in Chemical Engineering are both given under the direction of the Department of Chemistry, and facility is offered for changing from either course to the other at the end of either term of the Freshman year. The entrance subjects required are the same in both courses (see page 19), and the tuition and laboratory costs are practically the same. Subjects with the same title in the tabulated curricula (see pages 68 and 73) are given to students in both courses simultaneously and under the same teachers, and are equal in content. Details of chemistry subjects are described in the course in Chemical Engineering.

The study of English is carried through two full years of this course, beginning in the Freshman year and being resumed in the Junior year when the student has a more mature appreciation of literary values and of the necessity for clear and forceful expression in speech and writing. French and German receive considerably more attention in the course in Chemistry, than in the course in Chemical Engineering, both as language tools for the working chemist and in their cultural aspects. Students who enter the University with French continue French through the Freshman year, and take up German through the Sophomore and Junior years. Those who offer German as an entrance subject continue German through the Freshman and Sophomore years and study French through the Junior year. Students who offer Spanish for entrance take German through the Freshman and Sophomore years, and French through the Junior year.

The course in Bacteriology of the Senior year is given in the Department of Biology. A short course in Industrial Mineralogy accompanies the course in Assaying. Geology follows in the second term of the Junior year.

Economics throughout the Junior year and Modern European History through the Senior year are given by the Department of History and Economics. The same department supervises the Summer Reading in Economics, embracing such subjects as origins of industry and their relations to science, the economic import of inventions, industrial management, business law and custom and contracts. The topics for Summer Reading are also correlated in the lectures under the heading Economics, mentioned above. It is believed that this course of reading and study under expert guidance will inculcate an appreciation of the profit and pleasure to be derived from a continued interest in history and economics.

Applications of the science of chemistry and the science of physics to industrial chemistry and to chemical engineering are carried in the Senior year under the courses called Industrial Chemistry and Industrial Chemistry Laboratory. This covers a thorough-going description of numerous manufacturing processes and includes the necessary elements of chemical engineering. The industrial development of chemistry in the manufacture of metals is the subject of the various courses in Metallurgy and Electrometallurgy of the upper years. Here again the engineering features of many procedures are explained and receive critical study.

In order to acquaint the student with factory methods and personnel, a required summer term of work in factory or laboratory is set for the vacation following the Junior year. Young men of exceptional ability and ambition are encouraged to enroll in subjects given in the University not listed in the Course in Chemistry, subject to Faculty rules.

The foregoing course will serve as an excellent preparation for graduate study; students who desire to go forward to the Master's Degree (M.S.) will find information on page 137 of this Register.

THE COURSE IN CHEMISTRY

FRESHMAN YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Adv. Algebra	143	(4)	4	8	12	P. Anal. Geom.	145	(3)	3	6	9
Chemistry	390 or 393	(2)	2	4	6	Chemistry	394	(1)	1	1	2
Chem. Lab.	391or393a	(2)	6	0	6	Qual. Anal.	395	(3)	9	0	9
El. Mechanics	320	(3)	3	5	8	Qual. An. Conf.	396	(1)	1	2	3
French or German	94 72 or 76	(3)	3	6	9	Stoichiometry	397	(1)	1	1	2
						El. Mechanics	321	(3)	3	4	7
English	120	(2)	2	2	4	Phys. Measure	322	(1)	3	2	5
M.S. & P.E.	470, 500	(2)	4	2	6	French or German	94 72 or 76	(3)	3	5	8
		18	24	27	51	M.S. & P.E.	470, 500	(2)	4	2	6
								18	28	23	51

SUMMER TERM: R. O. T. C. Camp, with report, 470a, 6 weeks (3); Summer reading in Economics, 30 (1)

SOPHOMORE YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Cal. & S.A.Geom.	146	(4)	4	8	12	Int. Calculus	147	(4)	4	8	12
Adv. Chem.	398	(3)	3	3	6	Adv. Chem.	399	(3)	3	6	9
Quant. Anal	400	(3)	9	0	9	Quant. Anal.	404	(2)	6	0	6
Quant. An. Conf.	402	(1)	1	2	3	Quant. An. Conf.	405	(2)	2	1	3
Elec. & Mag.	323	(3)	3	4	7	Light & Sound	325	(3)	3	4	7
M. & H. Lab.	324	(1)	2	1	3	L., E. & M. Lab.	326	(1)	2	1	3
German	72, 76 or 78	(3)	3	5	8	German	72, 76 or 79	(3)	3	5	8
M.S. & P.E.	471, 500	(2)	4	2	6	M.S. & P.E.	471, 500	(2)	4	2	6
		20	29	25	54			20	27	27	54

SUMMER TERM: Assaying and Industrial Mineralogy, 4 weeks, 414 (3); Summer reading in Economics, 30 (1)

JUNIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Quant. Anal.	406	(2)	6	0	6	Org. Chem.	410	(4)	4	5	9
Quant. An. Conf.	407	(2)	2	2	4	Org. Chem. Lab.	411	(3)	9	0	9
Org. Chem.	408	(3)	3	3	6	I.& S.& Probs.	245,246	(3)	3	4	7
Org. Chem. Lab.	409	(2)	6	0	6	Gen. Geol.	268	(2)	2	3	5
G.Met.&Probs.	243,244	(3)	3	4	7	Economics	17	(3)	3	3	6
Economics	16	(3)	3	3	6	French or German	90 76 or 79	(3)	3	5	8
French or German	90 76 or 78	(3)	3	5	8	English	127	(3)	3	4	7
English	123	(3)	3	4	7	Physical Ed.	500	(1)	2	0	2
Physical Ed.	500	(1)	2	0	2			22	29	24	53
		22	31	21	52						

SUMMER TERM: Work in Industrial Shop or Laboratory (3); Summer reading in Economics, 30 (1)

SENIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Phys. Chem.	419	(3)	3	3	6	Phys. Chem.	421	(2)	2	3	5
Phys. Chem. Lab.	420	(1)	3	0	3	Phys. Chem. Lab.	422	(1)	3	0	3
Ind. Chem. Lab.	412	(3)	9	2	11	Ind. Chem.	415	(3)	3	3	6
Research Chem.	423	(3)	3	6	9	Research Lab.	424	(2)	6	0	6
N.F.Met.&Prob.	248,249	(3)	3	4	7	Ind. Chem. An.	416	(3)	9	0	9
Bacteriology	296	(2)	3	3	6	Ind. An. Conf.	417	(1)	1	1	2
El. Chem.	252	(1)	1	2	3	San. Chem. Lab.	418	(1)	3	0	3
History	41	(3)	3	3	6	N. F. Met.	250	(2)	2	2	4
Physical Ed.	500	(1)	2	0	2	El. Met.	253	(1)	1	2	3
						Hist. of Chem.	425	(1)	1	1	2
		20	30	23	53	History	42	(3)	3	3	6
						Physical Ed.	500	(1)	2	0	2
								21	36	15	51

Figures under letters above indicate the following: N, course numbers in Register; C, number of credit hours a week; R, number of clock hours a week in class; P, average number of clock hours a week in outside work and preparation; T, total number of hours a week.

THE COURSE IN CHEMICAL ENGINEERING

The requirements for admission to the Course in Chemical Engineering are given on page 19.

This course of study is designed to prepare the student for the profession of chemical engineering in the construction, control and management of manufacturing establishments which utilize principles of chemistry and its allied arts. Aside from the primary requirement of chemistry, the modern development of the chemical engineer enforces a thorough knowledge of physics and mathematics, together with sound understanding of such fundamentals in mechanical and electrical engineering as will make him a discriminating research and operating engineer.

The following descriptions of subjects given in the Department of Chemistry apply as well to these subjects in the Course in Chemistry. (See page 66.)

Elementary Chemistry, begun in the Freshman year, in lectures with demonstrations, text-books and recitations, is supplemented by experiments in the laboratory which develop manipulative skill and make careful observation habitual. An alternate course, less elementary in both class-room and laboratory, is given to entering students who have had a considerable training in elementary chemistry. (See page 30.)

After this preliminary view of the elements of chemistry, there is developed that deeper insight into the changes of matter which is the particular province of general chemistry. In Advanced Chemistry of the first term in the Sophomore year particular attention is paid to the theories and modern concepts of chemistry, including solution, equilibrium and energy relations of molecules and of atoms, radio-activity, etc.,—a kind of junior physical-chemistry of the greatest, everyday importance in chemical engineering. Continued through the second term, this subject covers a moderately advanced study of chemical substances, their preparation and properties, together with elementary consideration of phase rule and of such general applications as the relations underlying desirable properties in alloys, iron and steel, etc.

Organic Chemistry, taught during the entire Junior year, familiarizes the student with the simple compounds of carbon, and acquaints him with the usefulness of this branch of chemistry in science, in the chemistry of animal and plant life, and in the manufacture of such chemical products as dyes, drugs and medicines, oils, fats, waxes, and many others.

A course of lectures of two hours per week on Advanced Organic Chemistry is offered in the first half of the Senior year to students who have shown marked ability in the Organic Chemistry and Organic Chemistry Laboratory of the Junior year. This course is available for credit to graduate students who have completed a strong undergraduate course.

Introduction to the chemical analysis of substances is begun through Qualitative Analysis in the second term of the Freshman year. This is a laboratory course, proceeding from the recognition of individual substances to the analysis of more complex solutions and solids. Lectures and recitations elucidate the facts and theories underlying analytical chemistry. The simpler mathematical relations of chemical processes are reviewed under Stoichiometry and are illustrated through many problems solved by the student. Quantitative Chemical Analysis by gravimetric, volumetric and electrolytic methods follows through the Sophomore year and the first term of the Junior year, and takes up the analysis of ores, fuels, metallurgical products, commercial chemicals and by-products. Frequent class-room conferences accompany the laboratory work and consider the calculations involved and the scientific foundations of quantitative analysis. The analysis of industrial organic substances and of food-stuffs, drinking and boiler waters is placed in the final term of the Senior year, when the student has a better foundation in increasing experience and a broader outlook toward the important significance of Industrial Chemistry. At this stage, too, is placed the sampling and analysis of illuminating and heating gas, flue gases and other special gases.

Fire-assaying of ores and of gold and silver bullion is taught in the summer term after the Sophomore year when continuous attention throughout the day can be given to muffles and furnaces. The practice in Assaying is accompanied by extensive consideration of the calculations and theories involved in the production of mixtures favorable for the work in hand. A course in Industrial Mineralogy is a part of this summer work, and leads to familiarity with about seventy-five minerals of commercial importance. These minerals are studied in their crystalline forms, also in the forms in which they often present themselves for final utilization by the chemical engineer.

The laboratory methods of Physical Chemistry and the systematic, deeper study of generalizations of chemistry learned in the Sophomore year are reserved for the Senior year under Physical Chemistry. Interrelations of the fundamentals of matter and energy are developed under such cognate headings as two-phase and multiphase systems, thermodynamics, gas reactions, mass action, electrochemistry, colloid chemistry, etc. Attention is given to the usefulness of Physical Chemistry in the solution of manufacturing problems in Chemical Engineering.

Intensive instruction in the application of factory methods in Chemical Engineering is likewise placed in the Senior year and is grouped under Industrial Chemistry Laboratory and Industrial Chemistry. The processes reviewed are varied; such as transportation of gases, liquids and solids; grinding, pulverizing; mechanical, hydraulic and pneumatic separation; evaporation; distillation; filter pressing; centrifuging; autoclaving. Characteristics and adaptability of engineering materials used in apparatus and machines receive full discussion. Selected industries are investigated and explained. Familiarity with manufacture in its scientific and economic aspects is promoted in the special laboratory fitted with industrial apparatus, the student finally submitting full working specifications for a plant designed for the preparation of some industrial product, together with estimates of cost of raw material and cost of conversion into finished product. Lehigh University is fortunately situated in a district abounding in business enterprises which involve chemical engineering and visits are made to these plants and to factories in the nearby cities of Philadelphia and New York.

In Research Chemistry of the Senior year every student is required to solve a novel problem having a scientific basis and is expected to demonstrate some ability as an independent research worker. The research involves an exhaustive search for and study of the literature bearing on the subject in the University Library, and includes the patent literature. A short course in History of Chemistry, with individual reading of significant records, co-ordinates the past progress of the science and leads to a nobler pride and an enhanced initiative in the profession which the graduate enters.

Metallurgy and related subjects are taken in the Department of Metallurgy. These cover an extensive training in the principles and methods particularly applied to the recovery of metals from their ores, and the manufacture and properties of the industrial products, iron, steel, copper, zinc, lead, nickel, aluminium, mercury, gold and silver. Drawing is under the direction of the Department of Mining Engineering. Instruction in mechanical engineering, so important to the chemical engineer, is given by the Mechanical Engineering Department. Mechanical Engineering is developed in Heat Engines of the Junior year, and in the Engineering Laboratory of the summer term following the Junior year, with a continuation of Engineering Laboratory in the Senior year. Many of the problems and innovations of Chemical Engineering demand a more intimate knowledge of the principles and practice of Electrical Engineering than is given in the general course in Physics; this is provided for in the Junior year under Dynamos and Motors and Alternating Currents, with their laboratory adjuncts, in the Department of Electrical Engineering. A comprehension of the scope and general methods of Geology and Bacteriology is attained in short courses in these subjects. Bacteriology is a lecture and laboratory course, and a working knowledge of bacteriological methods as applied to water and some industrial products is achieved. The study of German, a necessary tool in current chemistry, is carried by all students in the Freshman year.

An approach to the affairs of men and the problems of business and civilization is carried in some period of all four years, and is under the direction of the Head of the College of Business Administration. The full course of lectures in Economics as given in the University is placed in the Junior year. Related reading is specified as summer work, and examination in this requirement is held on the first Saturday following the opening of the first term. Summer reading comprises such matter as origins of industry and their relation to science, industrial management, business law and custom and contracts.

A scientific society is attached to the Department, with a membership of teachers and students, for the presentation of papers, discussion of current journals, and the entertainment of speakers of note in the profession of chemical engineering.

The degree granted on completion of the course is Chemical Engineer (Ch.E.).

THE COURSE IN CHEMICAL ENGINEERING

FRESHMAN YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Adv. Algebra	143	(4)	4	8	12	P. Anal. Geom.	145	(3)	3	6	9
Chemistry	390 or 393	(2)	2	4	6	Chemistry	394	(1)	1	1	2
Chem. Lab.	391or393a	(2)	6	0	6	Qual. Anal.	395	(3)	9	0	9
El. Mechanics	320	(3)	3	5	8	Qual. An. Conf.	396	(1)	1	2	3
German	72 or 76	(3)	3	6	9	Stoichiometry	397	(1)	1	1	2
English	120	(2)	2	2	4	El. Mechanics	321	(3)	3	4	7
M.S. & P.E.	470, 500	(2)	4	2	6	Phys. Measure	322	(1)	3	2	5
						German	72 or 76	(3)	3	5	8
		18	24	27	51	M.S. & P.E.	470, 500	(2)	4	2	6
								18	28	23	51

SUMMER TERM: R. O. T. C. Camp, with report, 470a, 6 weeks (3);
Summer reading in Economics, 30 (1)

SOPHOMORE YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Cal. & S.A.Geom.	146	(4)	4	8	12	Int. Calculus	147	(4)	4	8	12
Adv. Chem.	398	(3)	3	3	6	Adv. Chem.	399	(3)	3	6	9
Quant. Anal	400	(3)	9	0	9	Quant. Anal.	404	(3)	9	0	9
Quant. An. Con.	402	(2)	2	2	4	Quant. An. Conf.	405	(2)	2	3	5
Elec. & Mag.	323	(3)	3	4	7	Light & Sound	325	(3)	3	4	7
M. & H. Lab.	324	(1)	2	1	3	L., E. & M. Lab.	326	(1)	2	1	3
Drawing	300	(1)	3	0	3	Drawing	300	(1)	3	0	3
English or German	123 73	(2)	2	2	4	M.S. & P.E.	471, 500	(2)	4	2	6
M.S. & P.E.	471, 500	(2)	4	2	6			19	30	24	54
		21	32	22	54						

SUMMER TERM: Assaying and Industrial Mineralogy, 4 weeks, 414 (3);
Summer reading in Economics, 30 (1)

JUNIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Quant. Anal.	406	(2)	6	0	6	Org. Chem.	410	(4)	4	5	9
Quant. An. Conf.	407	(1)	1	1	2	Org. Chem. Lab.	411	(3)	9	0	9
Org. Chem.	408	(3)	3	2	5	I.& S.& Probs.	245,246	(3)	3	4	7
Org. Chem. Lab.	409	(2)	5	0	5	Alt. Cur.	375	(2)	2	4	6
Dyn. & Mot.	354	(2)	2	4	6	Dyn. Lab.	356	(1)	3	1	4
Dyn. Lab.	355	(1)	3	1	4	Heat Eng.	224	(3)	3	6	9
G.Met.&Probs.	243,244	(3)	3	4	7	Economics	17	(3)	3	3	6
Heat Eng.	223	(3)	3	6	9	Physical Ed.	500	(1)	2	0	2
Economics	16	(3)	3	3	6						
Physical Ed.	500	(1)	2	0	2			20	29	23	52
		21	31	21	52						

SUMMER TERM: Engineering Laboratory, 4 weeks, 225 (3);
Summer reading in Economics, 30 (1)

SENIOR YEAR

FIRST TERM	N	C	R	P	T	SECOND TERM	N	C	R	P	T
Phys. Chem.	419	(3)	3	3	6	Phys. Chem.	421	(2)	2	3	5
Phys. Chem. Lab.	420	(1)	3	0	3	Phys. Chem. Lab.	422	(1)	3	0	3
Ind. Chem. Lab.	412	(3)	9	2	11	Ind. Chem.	415	(3)	3	3	6
Research Chem.	423	(2)	2	4	6	Research Lab.	424	(2)	5	0	5
N.F.Met.&Prob.	248,249	(3)	3	4	7	Ind. Chem. An.	416	(3)	9	0	9
Engr. Lab.	220	(1)	3	0	3	Ind. An. Conf.	417	(1)	1	1	2
Bacteriology	296	(2)	3	3	6	San. Chem. Lab.	418	(1)	3	0	3
El. Chem.	252	(1)	1	2	3	Hist. of Chem.	425	(1)	1	1	2
El. Chem. Lab.	255	(1)	2	1	3	N. F. Met.	250	(2)	2	2	4
English	137	(1)	2	0	2	El. Met.	253	(1)	1	2	3
Physical Ed.	500	(1)	2	0	2	Engr. Lab.	226	(1)	3	0	3
						Gen. Geol.	268	(2)	2	3	5
		19	33	19	52	Physical Ed.	500	(1)	2	0	2
								21	37	15	52

Figures under letters above indicate the following: N, course numbers in Register; C, number of credit hours a week; R, number of clock hours a week in class; P, average number of clock hours a week in outside work and preparation; T, total number of hours a week.

THE COURSE IN SHIP CONSTRUCTION AND MARINE TRANSPORTATION

The requirements for admission to the Course in Ship Construction and Marine Transportation are given on page 19.

The purpose of this course is to prepare men to engage in the design, construction and operation of ships, and to enter the field of marine transportation. The course is a combination of engineering and economics preceded by the fundamental subjects common to engineering courses: chemistry, modern languages, physics and mathematics. Combining, as it does, engineering training with studies in economics and business administration, such a course offers great advantages. It has been planned to develop a class of men, who in addition to a knowledge of conditions governing ocean and inland water transportation, will have a command of the technical, economic, and financial problems of ship design, construction and operation.

The first and second years are devoted largely to physics, modern languages, chemistry, engineering drawing, and mathematics, all of which afford necessary preparation for the technical work in later years.

The second year schedule, although largely concerned with science, embraces some preliminary work in engineering and economics. There is a detailed study of ship construction, including lectures and class room work covering the main features of ship construction, and also work in the drawing room where drawings of ship construction are worked up by the student. In the secord term the student fairs up a set of ship's lines. Both the transverse and longitudinal types of construction are given full treatment in this course.

The Junior year schedule includes these fundamental engineering subjects: Strength of Materials, Hydraulics, Naval Architecture, Steam Engineering, Marine Engineering, and Astronomy and Navigation. Class room work in most of the subjects is supplemented by exercises in the laboratories. In the first term of the third year a study is made of the theory of heat engineering and thermodynamics. This course is followed in the second term by a study of marine engineering with special emphasis on the types of propelling machinery, layout of the marine power plant and economic problems in marine engineering.

In the Senior year the student takes up the study of Ship Design, Marine Engines and Turbines, Structural Steel Design, Electrical Engineering, Economics, and Marine Transportation. For those who desire further work in foreign languages, an opportunity is given in the Senior year for the study of Spanish.

An important feature of the Lehigh Course in Ship Construction and Marine Transportation is the large amount of time devoted to the study of economics and allied subjects. To arouse the student's interest and to fit him for work in marine transportation and foreign trade, instruction in Economics and Economic Geography is given in the Sophomore year, followed by Accounting and Finance in the Junior year, and by Foreign Trade, Marine Insurance and Admiralty Law in the Senior year.

Surveying is given during four weeks of the summer term immediately following the close of the Freshman year.

Students are required to do summer work in shipyards and on shipboard, and the department co-operates in finding positions for them. The summer following the Sophomore year is spent in a shipyard. This brings the student into direct contact with practical ship construction and shipyard practices, so that he unconsciously acquires a knowledge of proportions and dimensions of engineering structures. The summer following the Junior year is spent at sea so that the student may observe the action of a ship at sea, and study the operation of the ship's power plant.

A pamphlet, giving further details, may be obtained by addressing the Registrar.

Graduates of this course receive the degree of Naval Engineer (N.E.).

THE COURSE IN SHIP CONSTRUCTION AND MARINE TRANSPORTATION

FRESHMAN YEAR

FIRST TERM

	N	C	R	P	T
Adv. Algebra	143	(4)	4	8	12
Chemistry	.390 or 393	(2)	2	4	6
Chem. Lab.	391or393a	(2)	6	0	6
El. Mechanics	320	(3)	3	5	8
French or German or Spanish	94 75 111	(3)	3	6	9
English	120	(2)	2	2	4
M.S. & P.E.	470, 500	(2)	4	2	6
		18	24	27	51

SECOND TERM

	N	C	R	P	T
P. Anal. Geom.	145	(3)	3	6	9
Qual. Anal.	395	(2)	6	1	7
Stoichiometry	397	(1)	1	1	2
El. Mechanics	321	(3)	3	4	7
Phys. Measure.	322	(1)	3	2	5
French or German or Spanish	94 75 111	(3)	3	5	8
English	122	(2)	2	2	4
Drawing	162	(1)	3	0	3
M.S. & P.E.	470, 500	(2)	4	2	6
		18	28	23	51

SUMMER TERM: Land and Topographic Surveying, 165, 3 weeks (3)

SOPHOMORE YEAR

FIRST TERM

	N	C	R	P	T
Cal. & S.A.Geom.	146	(4)	4	8	12
Elec. & Mag.	323	(3)	3	4	7
M. & H. Lab.	324	(1)	2	1	3
Metallurgy	247	(3)	3	4	7
Engr. Drawing	163	(3)	7	1	8
Ship Constr.	450	(2)	4	1	5
Economics	16	(3)	3	3	6
M.S. & P.E.	471, 500	(2)	4	2	6
		21	30	24	54

SECOND TERM

	N	C	R	P	T
Int. Calculus	147	(4)	4	8	12
Light & Sound	325	(3)	3	4	7
L., E. & M. Lab.	326	(1)	2	1	3
Econ. Geog.	35	(3)	3	6	9
Ship Constr.	451	(4)	9	2	11
Economics	17	(3)	3	3	6
M.S. & P.E.	471, 500	(2)	4	2	6
		20	28	26	54

SUMMER TERM: Work in Shipyard on Hull Construction, with report, 458, 8 weeks (3)

JUNIOR YEAR

FIRST TERM

	N	C	R	P	T
Str. of Mat.	167	(4)	4	8	12
Str. Mat. Lab.	168	(1)	3	0	3
Naval Arch.	452	(3)	3	5	8
Astronomy	150	(3)	3	6	9
Heat Engr.	218	(3)	3	6	9
Accounting	20	(3)	3	6	9
Physical Ed.	500	(1)	2	0	2
		18	21	31	52

SECOND TERM

	N	C	R	P	T
Hydraulics	170	(3)	3	6	9
Hyd. Lab.	171	(1)	3	0	3
Naval Arch.	453	(4)	4	8	12
Navigation	153	(2)	2	6	8
Marine Engr.	454	(4)	4	8	12
Finance	18	(2)	2	4	6
Physical Ed.	500	(1)	2	0	2
		17	20	32	52

SUMMER TERM: At Sea, with report, 458, 8 weeks (3)

SENIOR YEAR

FIRST TERM

	N	C	R	P	T
Ship Design	455	(3)	6	3	9
Marine Engs.	219	(3)	3	6	9
Str. Steel Des.	176	(4)	6	6	12
Engr. Lab.	220	(1)	3	0	3
Admiralty Law	32a	(2)	2	4	6
or Spanish	110	(3)	3	3	6
Dyn. & Mot.	354	(2)	2	4	6
Dyn. Lab.	355	(1)	3	1	4
Physical Ed.	500	(1)	2	0	2
		17	27	24	51

SECOND TERM

	N	C	R	P	T
Ship Design	456	(3)	6	3	9
Ship Operation	459	(2)	2	4	6
Term. Facilities	457	(2)	2	4	6
Engr. Lab.	226	(1)	3	0	3
Foreign Trade	29	(3)	3	6	9
English or Spanish	127 110	(3)	3	3	6
Alt. Cur.	375	(2)	2	4	6
Dyn. Lab.	356	(1)	3	1	4
Physical Ed.	500	(1)	2	0	2
		18	26	25	51

Figures under letters above indicate the following: N, course numbers in Register; C, number of credit hours a week; R, number of clock hours a week in class; P, average number of clock hours a week in outside work and preparation; T, total number of hours a week.

LIST OF STUDIES

Following is a complete list of studies offered by the University in its various courses. The number of exercises a week in each subject is indicated by the figures in parentheses. Two hours of drawing, three of work in the laboratory or three of practice in the field are regarded as equivalent to a recitation or lecture of one hour's duration.

UNDERGRADUATE COURSES

PSYCHOLOGY

PROFESSOR HUGHES

1. General Psychology. Woodworth. For B.A. students. Recitations and demonstrations. First term (3).

2. Educational Psychology. Individual differences; analysis of mental traits; learning and memory; how to study; transfer of training; motivation and character building; the psychology of specific activities, as of speech, writing, arithmetic, sport, art, religion. Assigned readings; quantitative studies; lectures and discussions. For B.A. students. Preparation required: 1. Second term (3).

3. Advanced Educational Psychology. Practice in administering individual and group tests. Study of administrative applications. Study of classical investigations in the general field covered by course 2, with some first-hand investigation or experiment. Preparation required 2. First term (3).

4. Elements of Clinical Psychology. Primarily for seniors in the pre-medical course. Abnormalities and diseases of the mind. The psychology of the emotions and of temperament. Individual studies, with use of intelligence and temperament tests. Psychotherapy. Mental Hygiene. Watson's *Psychology from the Standpoint of a Behaviorist.* Current magazine literature. Excursions to hospitals and clinics. Preparation required: 2. Second term (3).

5. Principles of Psychology. For B.S. students. Woodworth. Recitations and demonstrations. First term (2).

6. Economic Psychology. For B.S. students. Woodworth, continued. Problems of personnel, of motivation in industry,

and of industrial training. Assigned readings. Preparation required: 1 or 5. Second term (2).

7. EXPERIMENTAL PSYCHOLOGY. A course for Seniors who wish to conduct individual studies in some field of psychological experiment. Preparation required: 2 or 6. First or second term (1).

PHILOSOPHY

PROFESSOR HUGHES

8. HISTORY OF PHILOSOPHY. Ancient. A rather careful study of Plato's *Republic*. More's *Platonism*. Lectures and readings in the great philosophical tradition. First term (2).

9. HISTORY OF PHILOSOPHY. Modern. The rise of modern science, contrasted with Greek thought. Spinoza's *Ethics*. Tendencies in Modern Thought. Perry's *Present Conflict of Ideals*. Second term (2).

10. SCIENTIFIC METHOD. Historical survey of remarkable discoveries and inventions. The progress of the organization of knowledge. Idols of the tribe. Formal principles of proof. Libby's *Outline of the History of Science*, and Jevon's *Logic*. Second term (3).

EDUCATION

ASSISTANT PROFESSOR DROWN, PROFESSOR HUGHES

In this connection the student should study the statement on pages 38 to 40, concerning preparation for teaching.

11. INTRODUCTION TO TEACHING. Adjusting pupils' school and social interests. Introduction of pupil to effective methods of study. Subject matter and method related to technique and routine. Dewey, Earhart, Holley. First term (3).

12. HISTORY OF EDUCATION. The advance of civilization and culture and the parallel progress of educational theory and practice. (1) Evolution of subject matter; the liberal arts, letters, science, social sciences, the vernacular, vocational and fine arts. (2) Evolution of educational institutions; the university, the college, the secondary and elementary types, the rise of national and state school systems. (3) Educational leaders; how they reflected their times, and their contributions to educational philosophy and practice. Cubberley's *History of Education* and Readings. Second term (3).

13. Principles of High School Teaching. Character and qualifications essential to the high school teacher. The character of the high school student. Types of class exercises in the high school. Essential factors and devices of high school methods; lesson planning and the assignment; the question; note books and reports; reviews and examinations; the laboratory; experimentation and demonstration; the library and source material; problems and projects. Exercises in lesson planning, readings and observations. First term (3).

14. School Efficiency. State and local school systems. Organization of the school. Organization and routine of the class room; management, discipline, supplies, forms, reports; markings, grading, testing, promotion. The external and administrative aspects of teaching. Second term (3).

15. Problems of Secondary Education. Secondary education; its historical and comparative aspects; study of German, French, English and American secondary schools. The social background of American secondary education. The aims, values and functions of secondary education; analysis of each of the secondary subjects in terms of the same. The personnel of the secondary school. Problems arising out of adolescence; problems arising out of individual differences; problems arising out of economic and social conditions. Articulation with elementary and higher education; the Junior High School; the Junior College; accrediting and examination systems. Programs of studies; required and elective subjects. Administrative problems. Extra curricula activities; the teaching staff; the plant and its equipment; costs and finance. Second term (3).

16. Practice Teaching. This work is for the most part carried on in the Bethlehem High Schools. The Junior and Senior High Schools of Allentown and Easton also are observed. The work is divided into three approximately equal parts:

1. Observation and report with conference.
2. Apprentice work, involving participation in the routine work of the class, conduct of study periods and correcting of papers.

3. Actual conduct of class work, after careful study of lesson plans, followed by systematic criticism by assisting teacher and by the professors of the department.

   Junior and Senior years, for students in Education. (2) to (6).

Special Method. See courses 54, 83, 93, 339.

Educational Psychology. See courses 2 and 3.

BUSINESS ADMINISTRATION

PROFESSORS STEWART AND FOX, ASSOCIATE PROFESSOR BICKLEY,
ASSISTANT PROFESSORS CURTIS AND BROWN

ECONOMICS

16. Economics. A study of the elementary principles of political economy. Lectures and required reading in selected works. First term (3).

17. Economics. Practical economic problems; taxation, transportation, finance, labor, trusts, and monopolies. Second term (3).

18. Business Finance. A study of the financial needs of the different forms of industrial organization, including individual proprietorship, partnership, corporation, and holding company, together with various means of meeting these needs. Second term (2).

18a. Corporation Finance. A study of the means of financing a corporation, including the sale of commercial paper, common and preferred stock, debenture and mortgage bonds, promotion of new corporations, underwriting, re-organization and receivership. First and second terms (3).

19. Public Finance. Government expenditures and their relation to the functions of government and to social, political and industrial conditions; formulation of budgets; nature and employment of public credit; origin and growth of public debts; revenues from various sources, with reference both to the theory and to the practice of various nations. First and second terms (3).

20. Accounting Theory and Practice. A study of the fundamental principles of accounting with sufficient practice work to illustrate these principles. Theories of debit and credit; single

and double entry; construction of accounts; special books; distinction between capital and revenue and the problem involved; construction and analysis of financial statements; equity accounts; valuation of assets; methods and problems of depreciation. The economic aspects of accounting emphasized. First and second terms (3).

21. Corporation Accounting. (Elective, Junior year.) The application of accounting principles to corporations, corporation accounts and records. The voucher system; construction and analysis of corporate statements and reports; assets of corporations and their valuation; capital stock and the stock books; bonds and other forms of indebtedness; distribution of profits; handling surplus and reserves; sinking and other funds; liquidation of a corporation; combinations and consolidations; branch house accounting. Considerable practice work given during the second term. The problems are selected largely from examinations for Certified Public Accountancy. First and second terms (3).

21a. Auditing. (Elective, Senior year.) Procedure in conducting an audit; detection of errors and defalcations; financial conditions of a business as revealed by the accounts and other sources of information. The social responsibilities of auditing. First term (3).

21b. Cost Accounting. (Elective, Senior year.) The various systems of manufacturing accounts for different types of manufacturing enterprises; choice of methods to meet peculiar needs; installing cost systems; forms and records; manufacturing accounts as an aid to and as a check on production efficiency; preparation of reports for executives. Second term (3).

22. Transportation. Development of transportation facilities. Consideration, from the administrative viewpoint, of railways and waterways as factors in the social and industrial development of the United States. The organization of railways, considering charters and franchises, capital stock, directors and stockholders. The administration and operation of railways, considering the activities of the various departments,—transportation, traffic, executive, financial, and legal. Relations

between railroads and their employees. Public regulation and control of transportation facilities. First and second terms (2).

23. Labor Legislation and Administration. Labor problems confronting the employer and the more successful methods of meeting them and avoiding legal disputes. The legal status of unions and strikes. Protection of the employer's interests. Employer's Liability and Workmen's Compensation Acts. First and second terms (3).

24. Development of Economic Thought. The rise and development of economic systems and economic thought; the scope and method of political economy. Patten's *Development of English Thought* and the works on political economy of Keynes, Cohn and Ingram. First and second terms (3).

25. Investments. A comparative study of investment values (including bonds, stocks, notes, and mortgages) and the conditions affecting the investment market; with the emphasis on the securities of corporations as investments. First and second terms (3).

26. Statistics. Statistical method and applied statistics. Practice in the handling and especially in the interpretation of statistics. As much research as possible carried on. First and second terms (3).

27. Banking and Currency. A study of the banking system of the United States, comparing it with those of the important European states, together with a study of the currency and currency problems of this country. Special emphasis laid upon the Federal Reserve Act, foreign exchange, and factors affecting the money market. First and second terms (3).

28. Foreign Exchange. Foreign monies and exchange ratios, financing of exports and imports, factors determining exchange rates, statistical studies in the field of foreign exchange, instruments and forms used in foreign trade. First term (3).

29. Foreign Trade and Marine Insurance. An historical and statistical study of international trade; the organization of steamship lines; combines, export associations, and rate agreements; line and charter traffic and trade routes. A study of steamship ports and the influence of the hinterland with special attention to the relations of navigation or inland waterways and railway transportation to ocean commerce. Also a

study of the special methods necessary for successful trading with certain undeveloped but progressing nations. Principles of insurance and the peculiarities of marine risks and policies. Second term (3).

30. SUMMER READING IN ECONOMICS. Assignments for summer of 1923. Freshman: RESOURCES. Van Hise's *The Conservation of Natural Resources.* Sophomore: INDUSTRIAL SOCIETY. Marshall's *Readings in Industrial Society.* Junior: INDUSTRIAL ADMINISTRATION. Webb's *The Works Manager Today;* Gantt's *Organizing for Work;* Tead's *Instincts in Industry.* (1)

30a. BUSINESS ENGINEERING. The organization and financing of business associations, economics, accounting, finance. For Senior students in Engineering. First and second terms (3).

LAW AND POLITICAL SCIENCE

31. ELEMENTS OF BUSINESS LAW. The principles of contract; formation of contracts; operation and discharge of contracts. First term (2).

32. ELEMENTS OF BUSINESS LAW. Principal and agent; master and servant; sales of goods; negotiable instruments; business associations; partnerships and corporations. Second term (2).

32a. ADMIRALTY AND MARITIME LAW. Study of the principles and rules which regulate the conduct, the business and the property in matters of admiralty and maritime character. First term (2).

33. CONSTITUTIONAL LAW. The constitutional framework and the practical operation of the Federal and State governments. The relation of government to the business and social interests of the people. Interpretation of the Constitution by the various departments of the government. Comparison of American and European practice. First and second terms (3).

34. INTERNATIONAL LAW. The development of international law; its origin and history; economic and political changes determining the development of international relations; the Jus Gentium of the Roman Law and the "Natural Law" jurists. Law of Peace and War: general principles governing the normal relations of states and their relations in time of war.

The Law of Neutrality, with special reference to the contributions of the United States; problems associated with blockade, contraband of war, unneutral service. First and second terms (3).

ECONOMIC GEOGRAPHY

35. ECONOMIC GEOGRAPHY OF NORTH AND SOUTH AMERICA. Physical features, climate, and resources of the Western Hemisphere; their influence upon the economic, political, and social institutions. The present and prospective commercial relations of the United States with Mexico, Central and South America. First and second terms (3).

36. ECONOMIC GEOGRAPHY OF THE EASTERN HEMISPHERE. Physical features, climate, and resources of the Eastern Hemisphere; their influence upon the economic, political, and social institutions. Study of Great Britain, Germany, Russia, China, Japan, India and the Philippine Islands; the present and prospective commercial relations of these countries with the United States. First and second terms (3).

HISTORY

PROFESSOR STEWART,
ASSISTANT PROFESSORS CURTIS AND BROWN

38. INDUSTRIAL HISTORY. The evolution of modern industrial conditions as found in the growth of the economic powers of Great Britain, Germany and the United States. First and second terms (4).

39. THE POLITICAL AND CONSTITUTIONAL HISTORY OF THE U. S. PRIOR TO 1860. The era of constitution making, state and federal. Rise and growth of party government. The development of nationality and democracy. Political and constitutional questions arising in connection with internal improvements, the tariff, the bank and slavery. First term (3).

40. POLITICAL AND CONSTITUTIONAL HISTORY OF THE U. S. SINCE 1860. Continuation of course 39. Second term (3).

41. EUROPEAN HISTORY. The formation of the modern European nationalities. The rise of the universities. The revival of learning. The Reformation. The relations of Europe and America. First term (3).

42. EUROPEAN HISTORY. The history of modern Europe. The development of Great Britain. The French Revolution and the history of the Nineteenth Century. Second term (3).

43. AMERICAN FOREIGN RELATIONS. Studies in the diplomatic relations of the United States with the main countries of Europe, with the Near East and the Far East. First term (3).

44. UNITED STATES AND LATIN AMERICA. Problems arising out of the relations of South American states to one another and to the United States. Origin, development and application of the Monroe Doctrine. Second term (3).

44a. THESIS. Each candidate for the degree of B.S. in Business Administration is required to present a thesis on some topic related to the work of the College of Business Administration. Second term (3).

LATIN

PROFESSOR WRIGHT

45. OVID. Selections from the *Metamorphoses*. VERGIL. *Bucolics*. HORACE. Select *Odes*. Lectures on the history and development of pastoral and lyric poetry. The influence of Latin poetry upon English literature emphasized. Insistence upon tasteful translation. Freshman. First term (3).

46. HORACE. *Odes* continued. CATULLUS. Selections. Constant practice in reading the more important lyric metres. Memorizing of stanzas and passages from Horace. Freshman. Second term (3).

47. ANCIENT AND MEDIAEVAL CIVILIZATION. A course aiming to impart a knowledge of ancient and mediaeval life and thought, with special emphasis on literature, art, science and philosophy. Required readings in the best English translations of ancient authors. Assigned topics for investigation and report. Lectures on the art, architecture and daily life of the ancients, illustrated by stereopticon. Freshman. First and second terms (3).

Courses 45 and 46 are required of Freshmen in the B.A. course who enter with four units of Latin; others in that course take 47, except that those who present two or three units in Latin for entrance may, upon the approval of the Professor of Latin, continue Latin instead.

48. Livy. Selections from the books covering the war with Hannibal. Latin prose composition; or: Cicero. *De Senectute. Letters.* Catullus. A study of the literature and social life of republican Rome. Sophomore. First term, elective (3).

49. Plautus and Terence. Careful study of a play of each with rapid reading of as much more as time permits. Private life of the Greeks and Romans. History of the drama at Rome. Sophomore. Second term, elective (3).

50. Satire. Selected satires of Horace and Juvenal. Martial. Selected epigrams. Lectures on the history of Roman Satire and its influence on modern literature. Study of social conditions under the Empire. Junior and Senior. First term, elective (3).

51. Petronius. *Cena Trimalchionis;* or an advanced course in Comedy. Study of the language, syntax, and vocabulary of the *Sermo Plebeius.* Junior and Senior. Second term, elective (3).

52. Vergil. *Aeneid,* Books VII-XII. Lectures on the history of the Epic. Writing of brief dissertations on assigned topics. Juniors and Seniors. First term, elective (3).

53. Lucretius. Careful study of one book entire of the *De Rerum Natura,* with reading of selections from the other books. Consideration of textual questions. Discussion of ancient materialistic theories. Some review of Roman philosophy and ethics. Junior or Senior, elective, second term (3).

54. Courses for prospective teachers of Latin in secondary schools. Largely a review of secondary school Latin, the members of the class conducting the class in turn under the oversight of the Professor of Latin to the end that they may enter upon the teaching of Latin in preparatory or high school with freshened knowledge of the subject, and not without some experience in presenting it. Junior year, first term (2), second term (2). This course ordinarily taken in connection with Education, which see.

54a. Cicero. Orations and Letters. Prose composition and syntax, with special emphasis on clause construction. A course designed for students who enter with two years of high school Latin and who elect to continue their Latin rather than take course 47. First term elective (3).

54b. Vergil. *Aeneid*, Books I-VI. Prose composition continued. Practice in reading aloud and scansion. Training in sight translation. Some study of the mythology and religion of Greece and Rome. Second term elective (3).

GREEK

PROFESSOR GOODWIN

55. Lysias, Selected *Orations;* or Xenophon, *Memorabilia.* Review of the Grammar. Composition and other exercises. Careful study of Attic prose syntax; special attention given to the formation of correct methods of study and translation, to grammatical analysis, and the reading aloud of Greek. Available time employed in sight-reading. Herodotus. One book begun. First term (3).

56. Herodotus (continued). Study of the forms and syntax of the Ionic dialect. Plato. *Euthyphro*, *Apology*, or other shorter dialogues. Introduction to Greek Philosophy. Grammar and composition as in the first term. Second term (3).

57. Thucydides. One or more books. Practical exercises, including composition. First term (3).

58. Tragedy. Euripides. *Medea*, *Bacchae*, or another play. Sophocles. *Oedipus Tyrannus*, *Antigone*, or another. Literary study of the drama. Poetical language, style, and conception. Metrical reading. Composition. Second term (3).

59. Dramatic Poetry (continued). Aeschylus. *Agamemnon*, or *Prometheus Bound.* Aristophanes. *Clouds*, *Frogs*, or *Birds.* Aristotle. Chapters from the *Poetics.* Aristophanes as humorist and as moralist, with consideration of the tendencies which he satirized. Metres. Elementary text-criticism. First term (3).

60. Greek Oratory. Jebb's *Selections from the Attic Orators.* Demosthenes. Selected orations. Rapid reading, the student being supposed to have reasonable facility in understanding the Greek directly without rendering into English. Attention directed largely to those points which illustrate the development of Greek prose style. Second term (3).

61. Homer. Rapid reading of considerable portions of the *Iliad* or *Odyssey.* Homeric language, syntax, and metre reviewed, with some reference to the needs of intending teachers,

but chiefly as a foundation for the study outlined in course 62. First term (3).

62. LYRIC POETRY. Fragments of the Elegiac, Iambic, and Melic Poets. Selections from PINDAR or THEOCRITUS. Study of the development of poetry in Greece. Second term (3).

63. HELLENISTIC GREEK. *New Testament.* Selections from LUCIAN. To be substituted on occasion for 62. Second term (3).

Courses 59 and 61, 60 and 62 (or 63) are offered in alternate years, and are open to both Juniors and Seniors. Candidates for honors in Greek will be assigned special readings on request.

64. ELEMENTARY GREEK. A course offered (ordinarily only in alternate years) to Freshmen and Sophomores who have entered without Greek, but who desire to take up the study in college. They perform in two years approximately the amount of work required for admission from those who present Greek, and are prepared to proceed in the third year with course 55. The introductory book and a small portion of the *Anabasis* studied in the first two terms. Given in 1922-1923; to be omitted in 1923-1924. First and second terms (3).

65. ELEMENTARY GREEK, second year. *Anabasis* continued; *Iliad* (if time permits); Grammar and simple Composition. Omitted in the years in which the preceding course is given. First and second terms (3).

GERMAN

PROFESSOR PALMER, ASSISTANT PROFESSOR MORE, MR. ROEST

70. ELEMENTARY GERMAN. German Grammar and Composition. Easy German texts. First term (3).

71. ELEMENTARY GERMAN, continued. Composition based on work in the Grammar. Dictation. Reading of short stories by various modern authors. Second term (3).

72. ELEMENTARY GERMAN. A condensed course for Chemists, Chemical Engineers and Metallurgists who have entered without German. Grammar. Readings in the German of Chemistry. First and second terms (3).

73. GERMAN. Rapid reading of selected texts on chemistry. For Sophomores who have passed course 72. First term (2).

75. GERMAN. Thorough review of German Grammar. Prose composition. Modern German Prose; Scientific German. First and second terms (3).

76. GERMAN. The German of Chemistry. Review of German Grammar. Composition. First and second terms (3).

77. GERMAN. German Prose and Poetry. Heine, Keller, C. F. Meyer, Freytag, Storm, Heyse. Composition. First and second terms (3).

78. GERMAN. Modern German Prose. Rapid reading of representative texts. First term (3).

79. GERMAN. Goethe's *Faust*. Study of Part I. Lectures on the origin and development of the Faust story. Second term (3).

80. GERMAN. Nineteenth Century German Drama. Lectures, reading, reports on assigned work. First and second terms (3).

81. GERMAN. Goethe's Dramas: *Goetz*, *Egmont*, *Iphigenie*, *Tasso*, *Faust*, Part II. First and second terms (3).

82. GERMAN. The German Short Story, its origin and development. Rapid reading of illustrative stories, with particular attention to Gottfried Keller, Theodor Storm, C. F. Meyer, and Paul Heyse. Lectures and reports. First and second terms (3).

83. GERMAN. A course for prospective teachers in advanced German grammar. German composition, methods of teaching and discussion of text-books. First term (2).

ROMANCE LANGUAGES

PROFESSORS FOX, ASSISTANT PROFESSOR TOOHY,
MESSRS. BARZUN, PERKINS, DE MENEZES

FRENCH

90. ELEMENTARY FRENCH. Elementary French Grammar. Easy readings in French prose. Practice in speaking and writing simple French, based upon the texts used. A course intended primarily for Junior students in the College of Arts and Science; introductory to course 97. First and second terms (3).

91. ELEMENTARY FRENCH. An intensive course in Elementary French for Senior Metallurgists. Emphasis upon the develop-

ment of a reading knowledge of French. Grammatical drill limited to the essentials. First term (3).

92. Elementary French. A Sophomore elective for students in the College of Arts and Science who wish three years of French and can therefore give time to a more detailed drill in grammar and composition as well as practice in writing and science; introductory to course 97. First and second terms (3).

93. French. A course for students who wish a greater opportunity to practice in the oral and written use of modern French prose. Especially recommended for those who expect to teach French. First and second terms (2).

94. French. A course for Freshmen who enter on French. Thorough review of the grammar with composition work, both oral and written, based upon the grammar and upon the texts read. Texts selected from writers of modern French prose. First and second terms (3).

96. French. Text and methods. First or second term, or both (1) or (2).

97. French. Rapid reading. Sight translation. Dictation. Oral drill in the use of a practical vocabulary. First and second terms (3).

98. French Prose and Poetry. Balzac, Flaubert, Maupassant, Daudet, Zola. First term (3).

99. French Prose and Poetry. Continuation of course 98. Molière, Corneille, Racine. Society in the seventeenth century. Second term (2).

100. French. French literature in the seventeenth century. First term (3).

101. French. French literature in the eighteenth century. Second term (3).

102. French. Rapid reading of modern French authors, introducing certain of the social and political problems of France and her people today. Reading of texts by such authors as Thiers, Lamartine and Michelet, to furnish the necessary background. First and second terms (3).

103. French. General review of French literature. Reading, lectures and explanation of texts. First and second terms (3).

104. **French.** French literature in the nineteenth century. First and second terms (3).

105. **French.** French literature in the sixteenth century and earlier. May be substituted in place of 102, 103 or 104. First and second terms (3).

SPANISH

110. **Spanish.** Grammar, reading and composition. A course open to all students of the University. First and second terms (3).

111. **Spanish.** Reading and discussion in Spanish of texts dealing with the history of Latin American countries. Prose composition. First and second terms (3).

112. A continuation of course 110. First and second terms (3).

113. **Spanish.** Reading and discussion in Spanish of texts dealing with the commercial and industrial relations of Latin America. Spanish commercial correspondence. First and second terms (3).

114. (Alternate.) Spanish novels and plays. Short outline of Spanish literature. A second year course, intended more especially for students in the B.A. course; may be substituted by them for course 112. First and second terms (3).

PORTUGUESE

115. **Portuguese.** Grammar and composition. Rapid reading of modern literature, with particular reference to the history, social and economic conditions of Brazil and Portugal. First and second terms (3).

116. **Portuguese.** A continuation of course 115. First and second terms (3).

ITALIAN

117. **Italian.** Grammar and composition. Rapid reading of easy modern prose. First and second terms (3).

118. **Italian.** Masterpieces of the classic periods; outside reading. First and second terms (3).

ENGLISH

PROFESSORS THAYER AND LUCH,

ASSISTANT PROFESSOR MESCHTER, MESSRS. LAMBERT AND GOFF

120. RHETORIC. A composition course based on Genung's *Working Principles of Rhetoric* and Broughton's *Model Paragraphs*, involving recitations and weekly themes on assigned subjects. First term (2).

121. AMERICAN LITERATURE. Lectures and recitations on the basis of Pattee's *Century Readings in American Literature* and other text-books, as assigned. Examination based upon the text-book and the student's notes. First term (1).

122. HISTORY OF THE ENGLISH LANGUAGE. Lectures and classroom work, with the use of Emerson's *Brief History of the English Language* as a text-book, supplemented by Trench's *The Study of Words* (revised edition). Second term (2).

123. ENGLISH LITERATURE. An outline course developed by lectures and recitations, with parallel readings assigned annually. Text-book: Cunliffe, Pyre and Young's *Century Readings in English Literature.* First term (2) or (3).

124. LITERARY CRITICISM. Subject varying annually between topics taken from Elizabethan literature, lyric or dramatic, and from nineteenth century literature, earlier or later period. In 1923, Shakespeare's historical plays. Second term (2) or (3).

125. ORATORY. An introductory course based upon Mosher's *Extempore Speaking*, with recitations, the composition and delivery of orations, and speeches on topics of current interest. Second term (1).

126. ANGLO-SAXON. Sweet's *Anglo-Saxon Primer and Reader*, with lectures on early English literature, and readings from Brooke and Earle. First term (3).

127. TECHNICAL WRITING. A course of practical exercises in writing on scientific subjects. Text-book: Earle's *Technical Writing.* Second term (2), (3) or (4).

128. ENGLISH PHILOLOGY. The principles of the philology of the English language as developed in the works of Earle, Trench, Morris and Skeat. By a process of elimination the elements derived from Romance and other sources are excluded,

and the residuum examined, in vocabulary and grammar, as a Teutonic language; with special reference to the intensive development of the tongue before the Age of Chaucer. Preparation required: 126. Second term (3).

129. NINETEENTH CENTURY LITERATURE; later period 1830-1892. A special study of Tennyson, Arnold and Browning and some of the minor poets. Junior elective. First term (3).

130. MIDDLE ENGLISH. A critical study of the English of Chaucer, Langland, Wiclif and Gower; followed by the literary study of selected specimens of their works. Text-books: *The Student's Chaucer*, Skeat's edition of *The Vision of Piers the Plowman*, Wiclif's translation of the *New Testament*, revised by Purvey, and Gower's *Confessio Amantis* assigned. First term (3).

131. POETICS. A course based on Gummere's *Handbook of Poetics*, Alden's *English Verse*, Saintsbury's *Loci Critici*, and the use of Palgrave's *Golden Treasury*, and *The Oxford Book of English Verse*, with practical exercises in verse-composition. Senior elective. Second term (3).

132. DRAMA OF THE PAST. Based on Brander Matthew's *Chief European Dramatists;* with lectures, interpretations and a close study of plots and sources. First term (3).

133. CONTEMPORARY DRAMA. Lectures, criticisms and reading of typical plays. In 1922, American Drama down to date. Second term (3).

134. TWENTIETH CENTURY LITERATURE. The drama, novel, and lyric poetry since 1895. Junior elective. Second term (3).

135. THE DANISH ELEMENTS OF ENGLISH. A philological study based on Sweet's *Icelandic Primer*, Groth's *Danish Grammar* (pp. 1-29, 67-143) and the works of Jespersen and other philologists. Alternative with 130. Preparation required: 126, 128. Second term (3).

136. Optional courses on the Rise and Development of the English Novel and on the Arthurian Cycle offered in alternate years. Lecture courses, with private reading assigned; if supplemented by a rigid examination, taken as equivalent to one term's work in any class above the grade of Freshman.

137. ENGLISH CONFERENCES. First or second term (1), (2) or (3).

MATHEMATICS AND ASTRONOMY

PROFESSORS THORNBURG, LAMBERT AND OGBURN
ASSOCIATE PROFESSORS STOCKER AND REYNOLDS,
ASSISTANT PROFESSOR KNEBELMAN, MESSRS. LEYZERAH, SOLT, LYLE

140. Solid Geometry, beginning with Book VI and completing the subject. Second term (3).

141. Trigonometry. Plane Trigonometry, including the theory and use of logarithms. First term (3).

142. Trigonometry. Spherical Trigonometry, including the use of logarithmic tables. Second term (1).

143. Anvanced Algebra, beginning with the Theory of Quadratic Equations. Review of Plane Trigonometry and Elementary Algebra. First term (4).

144. Higher Algebra. Theory of Equations and other topics. First term (1).

145. Plane Analytic Geometry. Graphic representation of loci on cross-section paper, plane analytic geometry. Second term (3).

146. Differenial Calculus and Solid Analytic Geometry. Embracing applications to analytic geometry and practical problems. Preparation required: 145. First term (4).

147. Integral Calculus. General integration methods with applications to theory of center of gravity, moment of inertia, together with a short chapter on elementary ordinary differential equations. Preparation required: 146. Second term (4).

148. Differential Equations. Preparation required: 147. First term (1).

149. Analytic Mechanics. Differential equations of motion, treatment of forces in space, free and constrained motion of a particle and of masses, with applications to practical problems. Preparation required: 147. First term (2).

150. Descriptive Astronomy. A study of the fundamental facts and principles of the subject with solution of problems; observatory visits. First or second term (3).

151. Practical Astronomy. Study of instruments used, methods of taking and reducing observations to determine time, latitude, longitude and azimuth; observatory work in

which each student makes his own observations and computations in illustration of the problems studied. As this study is primarily for civil engineers, the sextant and engineer's transit are the chief instruments employed in the observational work. Preparation required: 141, 142, 147, 150. First term (3).

152. Analytic Mechanics. Preparation required: 147, 148, 149. Second term (3).

153. Navigation. Study of principles and instruments used in navigation, with practical navigation problems by modern methods. Second term (2).

CIVIL ENGINEERING

PROFESSORS FOGG AND WILSON,
ASSOCIATE PROFESSORS BECKER AND FULLER,
ASSISTANT PROFESSORS PAYROW, LEWIS AND UHLER, MR. CLARK

160. Engineering Drawing. The use of drawing instruments. Lettering and tracing. Mechanical drawing of objects. Simple projections. Isometric drawing. First term (3).

161. Engineering Drawing. The descriptive geometry of projections, intersections, and developments. Plans, elevations and sections of simple structural details. Preparation required: 160. Second term (2).

162. Engineering Drawing. The use of drawing instruments, lettering and simple projections. Second term (1).

163. Engineering Drawing. The descriptive geometry of projections, intersections and developments. Isometric drawings, plans, elevations and sections of simple structural details. Preparation required: 162. First term (3).

164. Engineering and Topographic Drawing. Problems in stone cutting, including plans for pipes, culverts and arches. Isometric drawings and linear perspective. Topographic maps. Preparation required: 163. Second term (2).

165. Land and Topographic Surveying. The theory and practice of land surveying, including computation of areas, dividing land, determining heights and distances. Map drawing and topographic signs. Field work with level and transit. Map drawing from students' field notes. Theory and use of stadia. Detailed field work in rough country; pen topography and contour maps. Preparation required: plane trigonometry and

engineering drawing. Summer term: a recitation and seven hours of field work each week-day for three weeks, beginning June 13, 1923.

166. RAILROAD SURVEYING. Reconnaissance, preliminary and location methods, with the theory of curves. Preparation required: 165. Summer term: a recitation and seven hours of field work each week-day for two weeks, immediately following course 165.

167. STRENGTH OF MATERIALS. The elasticity and strength of timber, brick, stone, and metals. Theory of beams, columns, and shafts, with the solution of many practical problems. Preparation required: 320, 321, 323, 147. First term (4).

167a. STRENGTH OF MATERIALS. An abridgment of course 167. Preparation required: 320, 321, 323, 147. First term (3).

168. STRENGTH OF MATERIALS LABORATORY. Fourteen experiments made by each student on wood, iron and steel to determine the action of materials under stress and to study the physical properties of materials of construction. The Fritz Engineering Laboratory, where this work is done, is equipped with 20,000, 50,000, 100,000, 300,000 and 800,000-pound machines for tension, compression and flexure, a 50,000-inch-pound machine for torsion and other apparatus for special work, In conjunction with 167 or 167a. Fee, $5. First term (1).

169. RAILROADS. Theory of curves and turnouts. Preparation of profiles and maps. The computation of earth work and estimates of cost. The construction of road-bed, including ballast, cross ties, rails, switches, culverts and other details. Preparation required: 166. First term (4).

170. HYDRAULICS. Hydrostatics and theoretical hydraulics. The flow of water through orifices, weirs, tubes, pipes, and channels. Naval hydromechanics. Hydraulic motors. The solution of many practical problems. Preparation required: 320, 321, 323, 147. Second term (3).

170a. HYDRAULICS. An abridgment of course 170. Preparation required: 320, 321, 323, 147. Second term (2).

171. HYDRAULIC LABORATORY. Fourteen experiments made by each student in the hydraulic section of the Fritz Engineering Laboratory, which is equipped with pumps, weirs, turbines,

water-wheels, meters and other apparatus for special work. In conjunction with 170 or 170a. Fee, $5. Second term (1).

172. Roofs and Bridges. Analytical and graphical determination of stresses in roof and bridge trusses under dead, live and wind loads. Locomotive wheel loads on plate girders and bridge trusses. Preparation required: 167. Second term (4).

173. Highway Engineering. The location, construction and maintenance of roads and pavements. Highway design. Preparation required: 165, 166. Second term (3).

174. Graphic Statics and Surveying. A special course given to Junior Mechanical Engineering students. The first part of the term devoted to the graphical determination of stresses in roof trusses by the force polygon. The last part of the term devoted to elements of plane surveying, including field work. Second term (3).

175. Structural Steel Design. Lectures and recitations. Theory of structural steel design and complete calculations for a through plate girder railroad bridge and for a highway truss bridge. Design of mill buildings and miscellaneous structures. Preparation required: 172. First term (3).

176. Structural Steel Design. A special course arranged for Seniors in Ship Construction and Marine Transportation. A study of the stresses acting on steel structures, with special attention to the local stresses in a ship's structure; the design of cranes, warehouses and other steel structures; solution of problems by graphical methods. Preparation required: 167. First term (4).

177. Bridge Design Drawing. Complete shop drawing for a single track through railroad bridge and a design drawing of a highway truss bridge for which calculations are made in course 175. Preparation required: 172. First term (3).

178. Graphic Statics. Analysis of the stresses in roof trusses by the force polygon. Applications of the equilibrium polygon to the discussion of beams and girders. First term (2).

179. Hydraulic and Water Power Engineering. Three recitations and one drawing-room exercise a week devoted to systems of water supply, including purification systems, reservoirs, pipe lines, pumping plants. The design of a water supply

distribution system. The measurement of flow in open channels by means of tubes and meters. Water power. Irrigation. Preparation required: 170. First term (4).

180. GEODESY. Recitations, calculations, field work. Precise leveling. Adjustment of instruments with investigation of their systematic errors. Elements of least squares and their application to the adjustment of triangulations. Field work in triangulation, in determination of azimuth, and with the plane table. Preparation required: 165, 166. First term (3).

181. RAILROADS AND TERMINALS. Maintenance of way, and the elements of railroad operation. Lectures on the economics of railroad location; the arrangement of yards, stations and terminals, train resistance, the application of electricity to the operation of railroads. Preparation required: 169. First term (3).

182. HIGHER STRUCTURES. Theory of continuous, draw, cantilever and suspension bridges, also metallic arches. The theory and design of masonry walls, dams, and arches. Theory of deflections and applications to statically indeterminate structures. Preparation required: 175. Second term (3).

183. REINFORCED CONCRETE DESIGN AND FOUNDATION. Theory of reinforced concrete; design of reinforced concrete buildings, arches and miscellaneous structures. Foundations. Preparation required: 175. Second term (3).

184. CEMENT AND CONCRETE LABORATORY. The manufacture, properties and testing of cement, mortar and concrete. All the standard tests made by each student on cement and on reinforced concrete beams and columns in the Fritz Engineering Laboratory. Preparation required: 183. Fee, $3. Second term (1).

185. CONTRACTS AND SPECIFICATIONS. Lectures on the essentials of contracts and specifications for engineering structures. Second term (2).

186. SANITARY ENGINEERING. Systems of sewerage and methods of sewage treatment and disposal. The design of a sewerage system. House drainage. Preparation required: 179. Second term (3).

SUMMER SCHOOL IN CIVIL ENGINEERING

165. LAND AND TOPOGRAPHIC SURVEYING. Exercises in land and topographic surveying, designed primarily for students of the University, but open to all persons prepared to take them, are given in the summer vacation. In 1923, this work begins at 8 a.m., on June 13, and runs for three full weeks. Students in Civil Engineering, in Mining Engineering and in Ship Construction and Marine Transportation are required to take this work. The fee for other persons is $30.

166. RAILROAD SURVEYING. Exercises in railroad surveying, beginning immediately after the close of course 165 and running for two full weeks.

187. SUMMER WORK IN CIVIL ENGINEERING. During the summer following the Junior year, students are required to spend at least eight weeks on shop work or on engineering construction.

MECHANICAL ENGINEERING

PROFESSORS LARKIN, KLEIN AND BUTTERFIELD,
ASSOCIATE PROFESSOR MEASE,
ASSISTANT PROFESSORS QUAST AND NORDENHOLT,
MESSRS. LEACH, KOLB AND KISTLER

200. DRAWING AND ELEMENTS OF MACHINE DESIGN. Orthographic, isometric and oblique projections, intersections and developments. Sketches and working drawings of machine pieces, tracings, details of screw-fastenings, keys and other fastenings. French's *Engineering Drawing*. First term (3).

201. HEAT ENGINES. Classification and types of engines, governors, valve gears, valve diagrams, indicator diagrams, efficiency. Fuels, combustion, boilers, superheaters, feed water heaters, condensers. Hirshfeld and Barnard's *Elements of Heat Power Engineering*. First term (3).

202. MECHANISM. A study of the mechanics of machine parts. Development of links, cams, gears, transmission machinery and the determination of dimensions from a standpoint of strength and durability taken up in detail in the class room. Practical problems developed in the drawing room. Keown's *Mechanism*. First term (3).

203. Elements of Machine Design. Calculations of the dimensions of elementary machine parts such as spur-, bevel- and worm-gears, pulleys, shafting, couplings, bearings, connecting rods, etc., from the forces acting upon or transmitted by such machine parts. Working drawings of these pieces. Mease and Nordenholt's *Elements of Machine Design.* Preparation required: 200. Second term (3).

204. Heat Engines. Continuation of 201. Hirshfeld and Barnard's *Elements of Heat Power Engineering.* Second term (3).

205. Mechanism. Continuation of 202. Keown's *Mechanism.* Second term (3).

206. Graphic Statics of Mechanisms. Graphical determination of the forces acting on all the various pieces constituting a machine, covering a great variety of machines; drawings of these machines given to the students. Consideration of frictional and inertia resistances and determination of the efficiencies of mechanisms. Text: Department Notes and Plates. Preparation: 203, 205. Fee, $2.50. First and second terms (2).

207. Heat Engines. Theory of Steam Turbines, Internal Combustion Engines, Gas Producers and Refrigeration. Class and drawing room work. Preparation required: 204. Hirshfeld and Barnard's *Elements of Heat Power Engineering.* First term (4).

208. Engineering Laboratory. Use and calibration of apparatus for measuring weight, volume, pressure, temperature, speed, etc., for engineering purposes. Carpenter & Diederich's *Experimental Engineering.* Fee, $3.50. First term (1).

209. Heat Engines. Theory of Steam Turbines, Internal Combustion Engines, Gas Producers and Refrigeration. Continuation of 207. Hirshfeld and Barnard's *Elements of Heat Power Engineering.* Second term (4).

210. Engineering Laboratory. Work of 208 continued. Indicator practice on engines in the laboratory and in factories and power plants in the neighborhood; complete working up of indicator diagrams from simple and compound engines, air compressors, etc. Carpenter & Diederich's *Experimental Engineering.* Fee, $3.50. Second term (1).

211. Advanced Machine Design. The design of machines in general, with special attention to the calculation and designing of the various parts for strength, stiffness and other requirements. Problems covering such machinery as cranes, hoists, pumps, machine tools, hydraulic machinery, etc. Kimball and Barr's *Machine Design.* First term (4).

212. Mechanical Engineering. Advanced work in Thermodynamics, Internal Combustion Engines and Steam Turbines with typical problems. Emsweiler's *Thermodynamics,* Streeter's *Gas Engines,* and Moyer's *Steam Turbines.* First term (4).

213. Engineering Laboratory. Work of 208 and 210 continued. Test of boilers, of power plants and pumping stations in the neighborhood. Carpenter and Diederich's *Experimental Engineering.* Fee, $3.50. First term (1).

214. Thesis. Each candidate for the degree of Mechanical Engineer is required to present a satisfactory thesis on some topic, showing a grasp of the underlying principles of the subject investigated. Second term (3).

215. Advanced Machine Design. Continuation of 211, being more specialized. Kimball and Barr's *Elements of Machine Design.* Second term (4).

216. Mechanical Engineering. Continuation of 212. Advanced work in Pumping Machinery, Air Machinery, and Refrigeration, with typical problems. Greene's *Pumping Machinery,* Peele's *Compressed Air,* and Greene's *Elements of Refrigeration.* Second term (4).

217. Engineering Laboratory. Work of 213 carried forward, along same lines. Analysis of flue gases; complete tests of power plants of the vicinity. Carpenter and Diederich's *Experimental Engineering.* Fee, $3.50. Second term (1).

218. Heat Engineering. The laws of gases and the gas cycles; the properties of steam and other vapors, the vapor cycles, entropy and the temperature-entropy diagram; a study of the theory of prime movers and the action of steam in engines and turbines; the use of the steam tables, the Mollier and temperature entropy diagrams. For students in the Course of Ship Construction and Marine Transportation. Hirshfeld and Barnard's *Elements of Heat Power Engineering.* First term (3).

219. MARINE ENGINES AND TURBINES. A detailed study of the multiple expansion reciprocating engine, the steam turbine and the Diesel engine. A study of the theory, economy and design of these three prime movers in the class room, supplemented by work in the laboratory. For students in the Course in Ship Construction and Marine Transportation. Hirshfeld and Barnard's *Elements of Heat Power Engineering*, Stirling's *Handbook*, Chapman's *Marine Power Plants*, Supino's *Land and Marine Diesel Engines*. First term (3).

220. ENGINEERING LABORATORY. A shorter course, selected and condensed from 208, 210, 213 and 217, especially in steam engineering, for students in courses other than Mechanical Engineering. Carpenter and Diederich's *Experimental Engineering*. Fee, $3.50. First term (1).

221. HEAT ENGINES. Short course for students in courses other than Mechanical Engineering, covering Steam Engines, Steam Turbines, Internal Combustion Engines and Boiler Plants. Hirshfeld and Barnard's *Elements of Heat Power Engineering*. First term (3).

222. HEAT ENGINES. Work of 221 completed. Hirshfeld and Barnard's *Elements of Heat Power Engineering*. Second term (3).

223. HEAT ENGINES. Classification and types of engines and power plant auxiliaries and apparatus, fuels, combustion, steam turbines, internal combustion engines; a composite course for students in the course in Chemical Engineering. Hirshfeld and Barnard's *Elements of Heat Power Engineering*. First term (3).

224. HEAT ENGINES. Continuation of 223. Hirshfeld and Barnard's *Elements of Heat Power Engineering*. Second term (3).

225. ENGINEERING LABORATORY. A summer course of four weeks for students in Chemical Engineering, comprising a series of experiments and tests of heat transfer, apparatus, calorimetry, heat engines and auxiliaries. Preparation required: 223, 224. Carpenter and Diederich's *Experimental Engineering*. Fee, $3.50. Summer term (3).

226. ENGINEERING LABORATORY. Work of 220 completed, along same lines. Carpenter and Diederich's *Experimental Engineering*. Fee, $3.50. Second term (1).

227. Work in Industrial Plant. Following the Sophomore year students are required to spend a minimum of eight weeks in industrial plants of approved character. A report is required. (3)

228. Student Apprenticeship, or Engineering Construction or Shop Work. Following the Junior year students are required to do a minimum of eight weeks of practical work, preferably as student apprentices, in the work they plan to follow after graduation. A report is required. (3)

METALLURGY

ASSOCIATE PROFESSOR ROUSH,
ASSISTANT PROFESSORS BUTTS AND PULSIFER

241. History of the Metals. A course of lectures designed to familiarize the beginning student with the historical phases of metallurgy and the importance of metals in the development of civilization. Preparation required: 390. Second term (1).

242. Introductory Metallurgy. A course of lectures on the properties and uses of the various metals, the geographical distribution of their ores and the condition of their production; their present economic and mechanical importance. Preparation required: 241. First and second terms (1).

243. General Metallurgy. A course of lectures discussing the general principles of Metallurgy as applied to the metallurgy of the various metals. Ores, fuels, combustion, pyrometry, refractories, furnaces, metallurgical processes and products, metals and alloys, slags and fluxes, blast and gases, smoke and fume. Hofman's *General Metallurgy;* Fulton's *Principles of Metallurgy.* Preparation required: 242, 398, 399. First term (2).

244. Metallurgical Problems. A course of problems embodying the use of the physical, chemical and mechanical principles as the basis of practical metallurgy. Data taken from actual practice, so that the results have an important bearing in the understanding of metallurgical processes. Reference: Richards' *Metallurgical Calculations, Part I.* Preparation required: 242, 397. Must accompany course 243. First term (1).

245. METALLURGY OF IRON AND STEEL. Chemical and physical properties of iron. Iron ores. Preparation of ores. The blast furnace. The mixer. Remelting. Refining. Puddling. The Bessemer process. The open-hearth process. Duplex process. Cementation. Manufacture of crucible steel. Electric steel. Alloy steels. Direct processes. Casting, forging and heat treatment. Reference books: Stoughton's *Metallurgy of Iron and Steel;* Austin's *Metallurgy of the Common Metals.* Preparation required: 243. Second term (2).

246. METALLURGICAL PROBLEMS. A course of problems involving the fundamental principles of the various processes in the metallurgy of iron and steel, to give the student an understanding of the quantitative relationships in the processes. Richards' *Metallurgical Calculations, Part II.* Preparation required: 243, 244, must accompany course 245. Second term (1).

247. METALLURGY. Short course. An abridgment of courses 243, 244, 245, and 246 for students in Civil, Mechanical, Electrical and Mining Engineering, Ship Construction and Marine Transportation. Reference books: Hofman's *General Metallurgy*, Stoughton's *Metallurgy of Iron and Steel*, Austin's *Metallurgy of the Common Metals*, Richards' *Metallurgical Calculations*, *Parts I and II.* Preparation required: 390, 397, 321. Must accompany or be preceded by 324. First or second term (3).

248. METALLURGY OF COPPER, LEAD, SILVER, GOLD. COPPER: Chemical and physical properties. Ores. Smelting sulphide ores. The Bessemer process. Treatment of oxide ores. Wet process. Electrolytic processes. LEAD: Chemical and physical properties. Ores. Smelting processes. Condensation of lead fume. Refining and desilverization of base bullion. SILVER: Chemical and physical properties. Ores. Smelting with lead. Amalgamation. Leaching processes. GOLD: Chemical and physical properties. Ores. Gold washing. Gold milling. Chlorination. The cyanide process. Parting gold and silver. Reference books: Schnabel's *Handbook of Metallurgy*, Gowland's *Metallurgy of the Non-Ferrous Metals*, Austin's *Metallurgy of the Common Metals*, Hofman's *Metallurgy of Copper*, Hofman's *Lead*, Collins' *Silver*, Rose's Gold. Preparation required: 234; for Mining Engineers, course 247. First term (2).

249. METALLURGICAL PROBLEMS. A course of problems concerned with the principles utilized in the metallurgy of copper, lead, silver and gold. Reference: Richards' *Metallurgical Calculations, Part III.* Preparation required: 244. Must accompany course 248. First term (1).

250. METALLURGY OF ZINC, MERCURY, TIN, ALUMINIUM, NICKEL, ETC. ZINC: Chemical and physical properties. Ores. Reduction by furnace and electrolytic processes, electrothermic processes. Manufacture of zinc oxide. MERCURY: Chemical and physical properties. Ores. Processes of extraction. ALUMINIUM: Chemical and physical properties. Ores Extraction by electrolysis. TIN, NICKEL, PLATINUM, ANTIMONY, etc.: Chemical and physical properties. Ores. Processes of extraction. Reference books: Schnabel's *Handbook of Metallurgy*, Gowland's *Metallurgy of Non-Ferrous Metals*, Austin's *Metallurgy of the Common Metals*, Ingall's *Zinc*, Richards' *Aluminium*, Louis' *Metallurgy of Tin*, Wang's *Antimony.* Preparation required: 243. Second term (2).

251. METALLURGICAL PROBLEMS. A course of problems concerned with the principles utilized in the metallurgy of zinc, mercury, aluminium, etc. Reference: Richards' *Metallurgical Calculations, Part III.* Preparation required: 244. Must accompany course 250. Second term (1).

252. ELECTROCHEMISTRY. Lectures discussing the historical development of the subject, particularly the phenomena of electrolysis and the various theories proposed to account for them. Current phenomena. Voltage phenomena. Energy relations. Electrode reactions. The electrolytic cell. Electrothermics. Reference books: Le Blanc's *Text-book of Electrochemistry.* Allmand's *Applied Electrochemistry.* Preparation required: 398, 399, 419, 421. First term (1).

253. ELECTROMETALLURGY. Lectures discussing the practical application of electricity to metallurgical processes. Electrolytic and electric furnace plants and practice. Reference books: Borcher's *Electric Smelting and Refining.* Allmand's *Applied Electrochemistry.* Preparation required: 243, 252. Second term (1).

254. ELECTROCHEMISTRY AND ELECTROMETALLURGY. A combination of courses 252 and 253, for students in Electrical and

Mining Engineering. Preparation required: 247. First term (2).

255. ELECTROCHEMICAL LABORATORY. Quantitative relations in the deposition of metals by electrolysis. Experimental study of the conditions controlling the nature of electrolytic deposits. Electrolysis of fused salts. Cathodic and anodic reactions. Fee, $5. Must accompany course 252. First term (1).

256. METALLURGICAL LABORATORY. Calibration and use of instruments employed in metallurgical investigations, pyrometers, calorimeters, etc. Determination of specific heats, latent heats of fusion and vaporization, vapor tensions, heats of combustion, heats of chemical combination and reaction. Heat conduction and radiation. Determination of efficiencies of furnaces. Experiments with electrochemical processes, electric furnaces, etc. Preparation required: 243, 245. Fee, $10. Second term (2).

257. METALLOGRAPHY. The study of metals and alloys: their physical, chemical and microscopic properties together with deductions drawn therefrom. The influence of thermal and mechanical treatment on physical properties and structure. Lectures and laboratory work. Reference books: Gulliver's *Metallic Alloys*, Sauveur's *Metallography and Heat Treatment of Iron and Steel.* Preparation required: 243, 245, 167, 168. Fee, $10. First term (3).

258. SEMINARY. A conference hour of the staff of the Department with students, to discuss current metallurgical processes and problems, and thesis work, involving some reading of current literature and other preparation on the part of the students. First term (3). Second term (2).

259. THESIS FOR DEGREE. Presentation by every student in Metallurgy of a thesis on some topic which requires original literary and other work, such as observations, calculations, or experimental tests when practicable. Second term (3).

GEOLOGY

PROFESSOR MILLER, ASSISTANT PROFESSORS TURNER AND FRETZ,
MR. BEHRE

266. MINERALOGY. The principles of crystallography with practice in the determination of forms of models and crystals. The physical properties, origin, occurrence, association and

alteration of minerals. A study of about two hundred of the common mineral species and varieties, particularly the rock-forming minerals, with practice in identification based on association and physical properties. Deposit, $5. First term (4).

267. Blowpipe Analysis. A course in qualitative blowpipe analysis and special chemical tests in which the chemical and physical behavior of all the common chemical elements and their compounds under various conditions is noted. Methods of rapid qualitative tests as a means of identifying minerals and chemical compounds with the aid of the blowpipe. Fee, $4. First and second terms (1).

268. General Geology. A course in dynamic, structural, and historical geology. Text-book, supplemented by illustrated lectures in which the relation of geology to engineering problems is discussed. The different geologic periods and their characteristic types of life. The principles of organic evolution as shown in the development of new forms in the successive periods are treated; also a brief review of the geology of the North American continent and the physical changes which it has undergone during its development. Second term (2).

269. Geological Laboratory and Field Trips. A study, during the winter months, of the various types of rocks, to enable students to determine and classify them without a microscope. Principles of rock classification presented in a series of lectures, supplemented by laboratory practice with a petrologic collection comprising rocks from all parts of the country. Attention given to the examination of the varieties of rocks used for constructional purposes with discussions of the factors which render them desirable. A series of lectures on primary and secondary rock structures, supplemented by laboratory work on the interpretation and construction of topographic and geologic maps and sections. Field trips weekly, during the spring months, to nearby localities to study rock structures and deposits of economic importance.

The region furnishes excellent examples of varied structures and contains numerous quarries where slate, cement rock, limestone, sandstone, gneiss and serpentine are obtained, all of which are visited by the classes. On such field trips, special attention is given to the methods of geologic mapping. Fee, $1. Second term (2) or (1).

270. Economic Geology. A study of the origin, modes of occurrence, properties, sources, production, and uses of the nonmetallic mineral products. Preparation required: 266, 268, 269. First term (2).

271. Economic Geology. A study of the metallic mineral products. Causes of the formation of cavities in rocks, their relation to metalliferous deposits; discussion of the theories of ore-deposition; the structure, geologic horizon, and geographic distribution of the principal metallic economic deposits of the United States. Recitations, illustrated lectures, field trips, and laboratory work. Visits, for the purpose of studying ore occurrence, to the zinc mines of Franklin Furnace, N. J., and Friedensville, Pa., the magnetite mines of Dover, N. J., and Cornwall, Pa., and the anthracite coal regions. Preparation by each student of a series of maps illustrating the location, production, and geology of the economic products of the United States. Preparation required: 266, 268, 269. Second term (4).

272. Paleontology. An elementary course in paleontology in which the animal life of the past is considered from both the biological and geological viewpoints. Theories of origin and evolution of life; principles of stratigraphy and paleontology. Study in the laboratory of index fossils of the successive geologic periods. Preparation required: 268, 269. Second term (3).

273. Geology of North America. The geological age and geographical distribution of the rocks of which North America is composed; the structure and history of its mountain ranges; the history of its geological development and origin; reviews of the great surveys that have been made. Lectures and laboratory work. Preparation required: 268, 269. Second term (3).

274. Physiography. The cosmic relations of the earth; the classification of land forms; the study of their origin, growth, and decay and the factors governing their development. Study of topographic and geologic maps. The relation of topography to geologic structure. The response of man and other organic life to an inorganic environment with special reference to the influence of physiography upon the economic development of

countries. Brief study of weather and climate. Second term (2).

275. Field Geology. Geological maps—their use and the methods by which they are constructed. Practice in the actual working out of surface geology. Problems in plotting geology on topographic maps, each student being assigned a definite area and required to make a geological map of it with structure sections. Collection by each student of a full set of specimens to illustrate the geology. The first part of the course is devoted exclusively to field work and the notes and specimens are studied in the laboratory when the weather prevents further out-door work. Preparation required: 268, 269. Fee, $1. First term (3).

276. Petrography. The optical properties of minerals and their study with the petrographic microscope. Petrography of the most important igneous rocks. Lectures, recitations and laboratory work. Preparation required: 266, 325. Fee, $3. First term (2).

277. Physiography. A study of topographic forms and the processes that have produced them; the weather and climate; and the influence of physical conditions upon the development of countries. First term (2).

278. Physiography. A continuation of course 277. Recitations, lectures and laboratory work. Physiographic regions of North America and Europe. Topographic maps and the preparation of weather and climate charts. Emphasis on the effect that physiographic conditions have in determining the commercial and industrial importance of nations. Second term (2).

279. Mining and Geologic Law. A study of the legal matters that confront a mining geologist. The law in regard to underground waters and mineral products. Preparation of abstracts of important cases, accompanied by drawings showing the geologic conditions upon which the decisions were made. First term (1).

280. Structural Geology. The study of special features of structural geology in the field and laboratory. First term (1).

281. Geologic Methods. The study of methods employed by the geologist in the various lines of geologic investigation.

Methods used by the United States Geological Survey and by the mining companies that employ geologists. Special attention to the problems that confront an economic geologist in the investigation of coal lands, oil properties, metal mines, etc. Second term (3).

BIOLOGY

PROFESSOR HALL, MR. KREIDLER

290. Botany. An elementary course treating of the structure and classification of plants. Preparation advantageous: 292. Second term (3).

291. Forestry. Lectures, recitations and laboratory work. A brief introduction to botany, followed by lectures on dendrology and text-book work on forestry. Laboratory work devoted mainly to dendrology and the characteristics of the wood of important timber species. Field trips during the autumn to enable the student to become familiar with the trees of the region. First term (2).

Careful consideration has been given by friends of the University and by the Board of Trustees to the matter of forestry in connection with the conservation of our natural resources. It does not appear to the Trustees that the present demand for professional foresters is such as to justify the establishment of a school of forestry at the University. It does appear that the question is of such great and growing importance that the University should do its part toward calling the attention not only of its students but of the section of country reached by the influence of the University to the need of a better knowledge of the principles involved. To this end courses of lectures have been instituted to which the public is invited and special instruction is given in forestry in certain of the courses.

In furtherance and support of the cause of Forestry the University has offered free tuition scholarships to graduates of the Pennsylvania State School of Forestry at Mont Alto, to pursue, as special students at this University, courses supplementary and cognate to their studies at Mont Alto.

292. Biology. Recitations from a text-book, laboratory work and lectures on the following topics: (*a*) fundamental concep-

tions; life, protoplasm, the cell, etc.; (*b*) the more important biological theories; variation, heredity, evolution, etc. In the laboratory, types of the various phyla are dissected and drawings made. Fee, $3. First term (3) or (5).

293. Comparative Anatomy of Vertebrates. Text-book work and recitations on the comparative anatomy of vertebrates, with a more extended discussion of biological theories. Laboratory work consisting of the dissection of types of the several vertebrate classes. Preparation required: 292. Second term (3).

294. Vertebrate Embryology. Lectures, text-book and laboratory work. Study of living, preserved, and sectioned material demonstrating the successive stages of cleavage, gastrulation, and the formation of organs. Preparation required: 293. First term (3).

295. Sanitary Biology. Lectures, recitations, assigned reading and laboratory work. Study of bacteria; microscopical appearance, methods of staining, plate and tube culture, etc. The quantitative and qualitative bacteriological and microscopical examination of water. Fee, $3. Second term (2).

296. Bacteriology. Recitations and laboratory work. General study of bacteria. Special attention to those forms which are economically important, such as those of water, foods, dairy products, soils, etc.; the action of preservatives. Preparation advantageous: 290 or 292. Fee, $3. First term (2).

297. Advanced Bacteriology. Lectures and recitations on the study of disease, immunity and sanitation. Laboratory work on the determination of species, with a special study of the pathogenic bacteria. Opportunity is given for the independent study of special problems in practical hygiene. Preparation required: 295 or 296. Fee, $3. Second term (2).

298. Physiology. A course in normal physiology, hygiene and sanitation aiming to give that knowledge of the body and its functions which all should have. Emphasis on the application of such knowledge to personal hygiene and public sanitation. Second term (2).

HYGIENE

DR. ESTES

299. Hygiene. Lectures on methods of personal hygiene and sanitary laws. For the benefit of engineering students who

may later, as engineers and explorers, be charged with the health oversight of men, suggestions are given in this course regarding the physical care and sanitary comfort of working groups.

MINING ENGINEERING

PROFESSOR ECKFELDT, ASSOCIATE PROFESSOR BARTLETT

300. MECHANICAL DRAWING. The use of instruments. Lettering and tracing. Isometric drawing. Sketches and working drawings of simple machine parts. Blue printing. DESCRIPTIVE GEOMETRY. Projections, intersections, and developments of cylinders, prisms, cones, etc. Application to graphical solution of mining problems. Second term (2). First term (1) or (2).

301. MINING ENGINEERING, PROSPECTING. Modes of occurrence of minerals. Uses of geology. Prospecting for placers, veins and beds. Magnetic prospecting. Drilling, sampling. Valuation of property. Location of claims. Patenting mining ground. BORING. Use of bore-holes. Methods: by percussion and rotation. Special methods. Shaft sinking by boring. Survey of bore-holes. EXPLOITATION. Location of plant. Rock drilling; tools and machines. Explosives; blasting; safety regulations. Shaft and slope sinking; tunneling. Supporting excavations by timber, metal, masonry, or concrete. Systems of mining underground and at the surface. HAULAGE. Surface and underground methods. Motors and cars, wire rope, aerial tramways. Loading and unloading, storage of minerals. Transportation of workmen. Signaling. First term (4).

302. ORE DRESSING. General principles and physical properties upon which the recovery of minerals or metals from ores are based, followed by detailed study of machines and apparatus used in modern practice for coarse and fine crushing; classifying and preparation for concentration; various methods of concentration, including gravity and magnetic methods, oil flotation, etc. Application of above methods to various ores; mill schemes or flowsheets. Study of procedure followed for treatment of ores and coal in typical modern concentrating plants. Mill location, construction, arrangement of machinery, operation and costs. Visits to mills and anthracite breakers.

ORE DRESSING LABORATORY. Experimental work and tests on ores, giving practical application of principles and processes covered. A well equipped modern laboratory gives opportunity for individual as well as class operation of the most approved machinery for the preparation of ores. Fee, $5. First term (3).

303. MINING ENGINEERING. HOISTING. Motors, ropes, attachments, receptacles. Safety appliances. Systems of hoisting. DRAINAGE. Surface water; prevention of access. Mine dams. Tunnel drainage. Mechanical drainage; water hoisting; pumping. Classes of pumps. VENTILATION. Atmosphere of mines. Pollution of air. Natural and mechanical methods of ventilation; systems. Types and efficiencies of ventilating machines. Instruments for testing air. Ventilating laws. LIGHTING. Methods employed. Safety lamps; electric lighting. Safety regulations. FIRST AID. Accidents; classes, causes. Means of prevention. Rescue work. Hygiene of mines; rules and laws. First Aid to injured. RAILROAD CONSTRUCTION. Earthwork, trackwork, trestles, bridges, railroad structures, water tanks, yards. Second term (4).

304. MINE SURVEYING. Instruments. Forms of notes. Outside work. Determination of meridian. Inside work. Connecting outside and inside work through shafts, slopes, or tunnels. Calculation of notes; mapping. RAILROAD SURVEYING. Preliminary and location methods; theory of curves, turnouts, etc. Care of maps. Detection of errors. Special problems. Fee, $1. Summer term at the end of Junior year, three weeks, beginning July 5, 1923.

305. MINING ENGINEERING. CONSTRUCTION MATERIALS. The use of stone, brick, concrete, metal and wood for foundations, piling, dams, reservoirs, retaining walls, mine buildings, railroads, trestles, tipples, ore bins and docks. MINE ADMINISTRATION. Organization, employment of labor, management, mine accounts, principles of mining. First term (3). Second term (1).

306. OIL AND GAS TECHNOLOGY. Origin and distribution of petroleum and natural gas. General survey of the geological conditions surrounding their accumulation. Oil shales. Prospecting and mapping. Location of wells. Drilling; pumping.

Special methods. Storage. Pipe lines. Tank cars. Second term (2).

307. MINING DESIGN. The design of parts of mining plant to meet given conditions, with detailed working drawings, accompanied by estimates of material and costs. Second term (3).

308. PROSPECTING. Surface indications of minerals, including oil, gas and water. Geological interpretation of strata and out-crops. Prospecting on surface and underground. Boring; magnetic prospecting. Mapping. Sampling and valuation of prospects. Locating and patenting claims. This course is offered as an elective for B.A. students. First term (2).

PHYSICS

PROFESSOR MAC NUTT, ASSOCIATE PROFESSOR FRY,
ASSISTANT PROFESSORS FRAIM, MARTIN AND KLEIN,
MESSRS. CONCILIO, GLENTZER, CARLTON, ZINSZER

320. ELEMENTARY MECHANICS. Statics. Lecture demonstrations and recitations. First term (3).

321. ELEMENTARY MECHANICS. Dynamics. Heat. Lecture demonstrations and recitations. Second term (3).

322. PHYSICAL MEASUREMENTS. Laboratory and lectures. Fee, $6. Second term (1).

323. ELEMENTARY PHYSICS. Electricity and magnetism. Lecture demonstrations and recitations. First term (3).

324. PHYSICAL LABORATORY. Mechanics, heat and electricity. Preparation required: 322. Fee, $6. First term (1).

325. ELEMENTARY PHYSICS. Light and sound. Lecture demonstrations and recitations. Second term (3).

326. PHYSICAL LABORATORY. Electricity, magnetism, light and sound. Preparation required: 322, 323, 324. Fee, $6. Second term (1).

327. ADVANCED THEORY OF ELECTRICITY AND MAGNETISM. Lectures and recitations. Ferro-magnetism, electro-magnetism, induced electromotive force and inductance, magnetic properties of iron, electric charge and the condenser, electric field, potential, electric oscillation and waves, electron theory, electrolysis. Pre-requisites, differential and integral calculus and course 323. First term (2).

328. Electrical Laboratory. Precise measurements. Preparation required: 322, 323, 324, 326. Fee, $6. First term (1).

329. Electrical Laboratory. Precise measurements. Continuation of 329. Fee, $6. Second term (1).

330. Electrical Laboratory. Advanced experimental studies and tests. Continuation of 320. Fee, $6. First term (1).

Courses 320 to 330, inclusive, are intended primarily for students in the College of Engineering.

331. Elementary Physics. A brief general course. Lecture demonstrations, recitations and laboratory. First term (3). Second term (3).

332. Modern Physics. A non-mathematical account of the modern views concerning such subjects as the Nature of Matter, Radio-activity, X-rays, etc. First term (2). Second term (2).

333. Introduction to Theoretical Physics. Mechanics, Thermodynamics, the Kinetic Theory of Gases, the Wave Theory of Light and the Mathematical Theory of Electricity and Magnetism. Preparation required, course 331, and differential and integral calculus. First term (3). Second term (3).

334. Laboratory Physics. A laboratory course of advanced character to accompany course 333. The experiments, in general, are designed to encourage originality on the part of the student. Fee, $6 per term. First term (2). Second term (2).

335. Physical Optics and Spectroscopy. Elementary treatment of the Wave Theory of Light, Interference, Diffraction, Polarization, etc. Exposition of some phases of spectroscopic phenomena. First term (3).

336. Electric Discharges Through Gases. The properties of gaseous ions, the experimental data leading to the Electron Theory, including a study of vacuum tube phenomena. Ionization and Resonance Potential, Photo-electricity, etc. Second term (3).

337. Laboratory Physics. A continuation of course 334 to accompany courses 335 and 336. Fee, $6 per term. First term (2). Second term (2).

Courses 331 and 332 are designed to meet the requirements in Physics for students in the College of Arts and Science and for students taking the Pre-Medical Course.

Courses 333 to 337 are designed for students in the College of Arts and Science who elect Physics as their major subject.

338. PHOTOMETRY AND ILLUMINATION. Lectures and recitations. Illumination standards, measurements of light and of illumination, laboratory methods and devices, commercial methods and experiments, comparison of illuminants and illuminating devices, practical installations. First term (1).

339. THE TEACHING OF PHYSICS IN SECONDARY SCHOOLS. Principles of scientific method. A study of class room practice in neighboring schools. Text-books and methods. First term (2).

340. TELEGRAPHY. Practice in sending and receiving the Morse and International Codes based upon Western Union and U. S. A. Signal Corps practice. First term (1). Second term (1).

ELECTRICAL ENGINEERING

PROFESSOR ESTY, ASSOCIATE PROFESSORS SEYFERT AND SCHEALER, ASSISTANT PROFESSORS BEAVER, GRUBER AND ESHBACH, MR. MILLER

351. ELECTRICAL DISTRIBUTION. Systems of direct current distribution; wiring formulas and applications; installation of electrical machinery and apparatus; interior wiring; overhead and underground construction; rules and regulations of the National Board of Fire Underwriters. First term (2).

352. DYNAMOS AND MOTORS. Review of principles of electricity and magnetism with special reference to their application to the dynamo. The construction, operation and control of direct current machinery; practical operation and management of dynamo machines; station equipment; cost of electrical energy; electro-magnets, magnetism of iron; characteristic curves, armature windings. Illustrative problems. Preparation required: 323, 324. Second term (3).

353. DYNAMO LABORATORY. Introductory course supplementing the class work of 352. Experimental studies and tests of direct current generators, motors, and appliances, for characteristics, regulation, efficiency, insulation, etc. Fee, $6. Preparation required: 323, 324. Second term (1).

354. DYNAMOS AND MOTORS. An abbreviated course adapted to those students who do not continue this subject in the following year; the principles and practice of direct current engineering, including: the elementary theory, construction, operation and control of direct current generators and motors, electromagnets, solenoids, automatic starters and controllers, station equipment, storage batteries. Illustrative problems. Preparation required: 323, 324. First and second terms (2).

355. DYNAMO LABORATORY. Introductory course supplementing the class work of 354. Experimental studies and tests of direct current generators and motors for characteristics, regulation, efficiency, etc. Fee, $6. Preparation required: 323, 326. First and second terms (1).

356. DYNAMO LABORATORY. Continuation of 355 and supplementing the class work of 361 or 375. Advanced testing of direct current machines; practice in operating and testing alternating current apparatus. Fee, $6. Preparation required: 355, 354. First and second terms (1).

357. THEORY OF ALTERNATING CURRENTS. The elementary principles of alternating currents. Lectures, recitations and problem work. Preparation required: 352, 326. First term (3).

358. DYNAMO LABORATORY. Continuation of 353. Advanced testing of direct current machines. Fee, $6. Preparation required: 352, 353. First term (1).

359. THEORY OF ALTERNATING CURRENTS. Continuation of 357. Advanced theoretical studies of alternators, synchronous motors, and synchronous converters. Preparation required: 357. Second term (2).

360. ELECTRICAL ENGINEERING. Application of physical and mathematical principles to the analysis and solution of problems relating to direct and alternating current circuits and apparatus; transient phenomena, use of complex quantities; non-harmonic periodic wave forms. Preparation required: 327, 357. Second term (3).

361. ELECTRICAL ENGINEERING. A course particularly adapted to students who do not further specialize along electrical lines; systems of generation, transformation, distribution and transmission of electrical energy by direct and alternating currents;

the application of electric motors to various industries; overhead and underground construction; estimates and costs. Preparation required: 354, 355. Second term (2).

362. Dynamo Laboratory. Continuation of 356 or 358. Advanced testing of direct current machines. Alternating current testing begun. Fee, $6. Preparation required: 357, 358. Second term (1).

363. Alternating Current Machinery. Study of the structural details, characteristics and operation of alternators, alternating current motors, rotary converters and transformers; application of vectors. Preparation required: 327, 359, 360. First term (4).

364. Dynamo Testing. Lectures on the methods of testing electrical machinery and apparatus, including direct current generators, motors and motor generator sets. Special methods of testing large machines; commercial tests as carried out by the large manufacturing companies. Preparation required: 327, 357, 358. Second term (1).

365. Dynamo Testing. Continuation of 364. Lectures on testing of alternating current machinery and apparatus, including generators, motors, rotary converters, transformers, induction regulators, etc. Preparation required: 359, 364. First term (1).

366. Dynamo Laboratory. Advanced experimental studies and tests of direct and alternating current generators and motors, synchronous converters, transformers and auxiliary apparatus; measurement of power in polyphase circuits. Fee, $12. Praparation required: 359, 360, 362. First term (3).

367. Electrical Design. Application of electric, magnetic and mechanical principles to the design of electromagnetic mechanisms, direct current generators and motors; predetermination of characteristics and performance; armature windings. Lectures, recitations, problems, drafting. Preparation required: 359, 360, 362. First term (2).

368. Electric Stations. Consideration of prime movers; generating machinery, discussion of types and operation; auxilliary machinery and transformers; storage batteries and their application; switch-boards, measuring and protective devices; design and arrangement; station characteristics; sub-

stations; operation and management; visits to neighboring plants. Preparation required: 359, 362. First term (2).

369. ELECTRICAL ENGINEERING SEMINARY. A weekly meeting held in the department reading room for discussion of topics from the current journals of theoretical and applied electricity. Presentation of papers on assigned topics; new inventions and discoveries critically reviewed. Preparation required: 357, 360. First term (1).

370. ELECTRICAL DESIGN. Continuation of 367. Application of electric, magnetic and mechanical principles to the design of alternating current machinery and apparatus; predetermination of characteristics and performance; armature windings. Lectures, recitations, problems, drafting. Preparation required: 363, 366, 367. Second term (2).

371. ELECTRIC TRACTION. Optional with 378. The construction, equipment and operation of different types of electric railways. The application of electric traction under steam railroad conditions; the dynamics of electric train movements; predeterminations of speed-time curves and the power required for different types of runs. Choice of car equipment; cost of construction and of operation. Testing of railway systems. Visits of inspection to power plants and required reports. Preparation required: 363, 368. Second term (3).

372. ELECTRIC POWER TRANSMISSION. The long distance transmission of power by electricity for use in lighting, traction, mining and manufacturing work. Mathematical determination of line constants, regulation, interference, transients, etc. Switching and protection of circuits; metering and methods of charging for power; recent practice in design and construction of lines and systems. Preparation required: 375 or 363, 368 or 361. Second term (3).

373. ELECTRICAL ENGINEERING SEMINARY. Continuation of 369. Presentation and discussion of reports on thesis work. Preparation required: 369. Second term (1).

374. DYNAMO LABORATORY. Continuation of 366. Advanced alternating current testing. Fee, $12. Preparation required: 363, 365, 366. Second term (2).

375. ALTERNATING CURRENTS. A course following course 354; the principles and practice of alternating current engineering; the theory of alternating currents with applications to alternating current generators, motors, transformers and other apparatus; systems of transmission and distribution; electric lighting. Preparation required: 354. First and second terms (2).

376. INSPECTION REPORT. During the vacation between the Junior and Senior years each student in Electrical Engineering is required to inspect some electric railway system, lighting or power plant, or other electrical installation, and prepare a written report thereon. A descriptive outline of the installation which the student proposes to inspect must be submitted to the Professor of Electrical Engineering before July 5th, and after approval the detailed report must be handed in before September 20th. These reports should contain such calculations, photographs, drawings and plots as each individual case may require.

377. THESIS FOR DEGREE OF E.E. Each candidate for the degree of Electrical Engineer is required to present a thesis upon a subject chosen by the candidate during the first term of the Senior year. The work upon which the thesis is based is done during the second term, and it consists in part of reading from references furnished by the professor in charge, and in part of independent work in theory, experimental research, or designing. Reports of progress on thesis work are required from time to time during the term. Much importance is attached to the thesis as evidence of the candidate's ability to carry out an independent investigation. Second term (3).

378. ELECTRICAL COMMUNICATION. Optional with 371. A survey of the methods of electrical ocmmunication, principles of various systems of wire telegraphy, wire telephony, radio telegraphy and telephony, radio laboratory measurements, radio practice of the U. S. Signal Corps. Fee, $6. Preparation required: 357 or 375. Second term (3).

CHEMISTRY

PROFESSORS ULLMANN AND BABASINIAN,
ASSOCIATE PROFESSORS DIEFENDERFER, CHAMBERLIN AND LONG,
ASSISTANT PROFESSORS BECK, EWING, CARTER, ANDERSON,
AND OPDYCKE, MESSRS. BUCKLEY, CANTELO AND SMULL

390. ELEMENTARY CHEMISTRY. Description of the non-metallic and metallic elements and their compounds. Lectures illustrated by experiments, diagrams, working drawings and specimens from the museum. Note-books on the lectures required. First term (2).

391. CHEMISTRY LABORATORY. Experiments covering a systematic study of the chemical and physical properties of the more important elements and their compounds. Long and Chamberlin's *Experimental General Chemistry*. Deposit, $15. First term (2).

392. CHEMISTRY LABORATORY. For B.A. students. Shorter course than course 391. Deposit, $15. First term (1).

393. CHEMISTRY. A course for students who pass the examination in Elementary Chemistry held on the first Saturday of the term. Smith's *Intermediate Chemistry for Colleges*. First term (2).

393a. CHEMISTRY LABORATORY. Experiments designed to accompany 393. Deposit, $15. First term (2).

394. CHEMISTRY. Continuation of 390 and 393. Second term (1).

395. QUALITATIVE ANALYSIS. Practical work in the qualitative laboratory, accompanied by lectures and recitations. Treadwell's *Analytical Chemistry, Vol. I*. Deposit, $25. Second term (2) or (3).

396. QUALITATIVE ANALYSIS CONFERENCE. Special consideration of science underlying qualitative analysis. Second term (1).

397. STOICHIOMETRY. Chemical problems and reactions. Long and Salisbury's *Chemical Calculations*. Second term (1).

398. ADVANCED CHEMISTRY. Lecture course, with recitations. Theories of chemistry; physical and chemical methods of determining atomic and molecular weights, thermo-chemistry, dissociation, solution, catalysis, electrolysis, radio-activity, non-metallic elements and their compounds. Preparation re-

quired: 390 or 393, 391, 397. Mellor's *Modern Inorganic Chemistry.* First term (3).

399. ADVANCED CHEMISTRY. Lecture course, with recitations. Phase rule, solid solutions, colloid chemistry, metallic elements and their compounds. Preparation required: 398. Mellor's *Modern Inorganic Chemistry,* Gulliver's *Metallic Alloys.* Second term (3).

400. QUANTITATIVE ANALYSIS. Practical work in the quantitative laboratory, accompanied by lectures and recitations. Acidimetry, alkalimetry, chlorimetry, and the determination and analysis of simple chemical compounds and ores. Treadwell's *Analytical Chemistry, Vol. II.* Deposit, $30. First term (3).

401. QUANTITATIVE ANALYSIS. Practical work in the quantitative laboratory. Analysis of simple chemical compounds, ores and metallurgical products. Deposit, $25. First term (3).

402. QUANTITATIVE ANALYSIS CONFERENCE. Lecture and recitations concerning the laboratory work of 400 and 401. First term (2) or (1).

403. QUANTITATIVE ANALYSIS. Continuation of 401. Deposit, $30. Second term (3).

403a. QUANTITATIVE ANALYSIS. Summer course arranged for students in Metallurgy. Deposit, $40. Summer term (3).

404. QUANTITATIVE ANALYSIS. Continuation of 400. Analysis of minerals, ores, slags, alloys, electrolytic analysis, etc. Treadwell's *Analytical Chemistry, Vol. II.* Deposit, $30. Second term (2) or (3).

405. QUANTITATIVE ANALYSIS CONFERENCE. Lectures and recitations concerning laboratory work of 403 and 404. Second term (2) or (1).

406. QUANTITATIVE ANALYSIS. Continuation of 404. Ores and alloys, complete analysis of iron and steel; also gas analysis, mineral water analysis, etc. Treadwell's *Analytical Chemistry. Vol II,* Lord and Demorest's *Notes on Metallurgical Analysis,* Hempel's *Gas Analysis.* Deposit, $25. First term (2).

407. QUANTITATIVE ANALYSIS CONFERENCE. Discussions concerning the laboratory work of 406. First term (2) or (1).

408. ORGANIC CHEMISTRY. Lectures and recitations. Typical compounds of carbon, their classification, general relations, and methods of preparation of important compounds. Bernthsen's *Organic Chemistry,* translated by Sudborough. First term (3).

409. ORGANIC CHEMISTRY LABORATORY. Determinations of specific gravities, melting points, boiling points, vapor densities; qualitative and quantitative determinations of carbon, hydrogen, nitrogen, and the halogens. Preparation of pure organic compounds. Gattermann-Schober's *Practical Methods of Organic Chemistry*, Cohen's *Practical Organic Chemistry*. Deposit, $20. First term (2).

410. ORGANIC CHEMISTRY. Continuation of 408. Lectures and recitations. Second term (4).

411. ORGANIC CHEMISTRY LABORATORY. Continuation of course 409. Practical methods of saturation, nitration, reduction, diazotization, sulphonation, etc. Preparation of pure compounds. Study of the properties of dyes and other commercial products. Gattermann-Schober's *Practical Methods of Organic Chemistry*, Cohen's *Practical Organic Chemistry*. Deposit, $40. Second term (3) or (2).

411a. ADVANCED ORGANIC CHEMISTRY. Satisfactory completion of courses 408, 409, 410, 411 is a prerequisite. First term (2).

412. INDUSTRIAL CHEMISTRY. Engineering fundamentals, including machinery and materials of chemical plants, transportation of gases, liquids and solids, grinding, pulverizing, screening, filtration, evaporation, distillation, etc. Laboratory work includes the application of these fundamentals, with reports on various problems of chemical engineering. Deposit, $25. First term (3).

413. ASSAYING. Lectures and laboratory practice in the furnace assay of the ores of lead, tin, gold, silver and of gold and silver bullion. Cyanidization. Calculations for slag and slag mixtures. Lodge's *Notes on Assaying*. Deposit, $30. Summer term: four weeks, beginning June 13, 1923, (3).

414. ASSAYING AND INDUSTRIAL MINERALOGY. This -covers much of the ground of 413. In addition there is instruction and laboratory work in Industrial Mineralogy, embracing about seventy-five minerals and rocks. It is intended primarily for students in Chemistry and Chemical Engineering. Deposit, $30. Summer term, four weeks, beginning June 13, 1923, (3).

415. INDUSTRIAL CHEMISTRY. Continuation of 412. Lectures, problems and inspection trips on chemical processes and industries. Second term (3).

416. Industrial Analysis. Analysis of commercial products. Laboratory work. Allen's *Commercial Organic Chemistry.* Deposit, $10. Second term (3).

417. Industrial Analysis Conference. Lectures concerning the laboratory work of 416. Second term (1).

418. Sanitary Chemistry Laboratory. Qualitative and quantitative examination of drinking water and food-stuffs. Deposit, $15. Second term (1).

419. Physical Chemistry. Lectures and recitations. Lewis' *A System of Physical Chemistry.* First term (3).

420. Physical Chemistry Laboratory. Physico-chemical measurements. Findlay's *Practical Physical Chemistry.* Deposit, $10. First term (1).

421. Physical Chemistry. Continuation of 419. Second term (2).

422. Physical Chemistry Laboratory. Continuation of 420. Deposit, $10. Second term (1).

423. Research Chemistry. Advanced stage of study or an investigation approved by the Professor of Chemistry of some novel problem, involving exhaustive laboratory and library study. Deposit, $15. First term (2) or (3).

424. Research Chemistry Laboratory. Continuation of 423. Deposit, $15. Second term (2).

425. History of Chemistry. Chronological development of the science, with assigned reading. Second term (1).

Deposits to cover breakage, chemicals, etc., are required as indicated above. The unused portion of the deposit is returned to the student.

Summer Schools. A course in Quantitative Analysis begins July 16, 1923, and continues for four weeks. The required course in Assaying and Industrial Mineralogy (414) begins June 13, 1923, and a second course may be given later. Summer courses are open to all persons prepared to take them.

SHIP CONSTRUCTION AND MARINE TRANSPORTATION

PROFESSOR CHAPMAN, MR. CLARK

450. Ship Construction. One recitation and one drawing period a week. A study of the construction of modern steel ships. The class-room work is paralleled by drawing-room

exercises, where the student works up a number of construction drawings based on the rules of the Registration Societies. Full treatment given to both longitudinal and transverse types of construction. Holms' *Practical Ship Building*. First term (2).

451. SHIP CONSTRUCTION. A continuation of course 450, taking up details of ship construction, bow and stern construction, and special types of construction. During the courses 450 and 451 the student fairs a set of ship's lines. Second term (4).

452. NAVAL ARCHITECTURE. Displacement, stability, trim launching and strength of ships. Class room work paralleled by calculations in the drawing room. A displacement sheet worked up, a curve of statical stability calculated by use of the integrator, and launching calculations carried out. Course illustrated by numerous practical problems. Preparation required: 147. First term (3).

453. NAVAL ARCHITECTURE. Resistance, powering and propulsion; steering and maneuvering; and rolling of ships. A study made of the effect of size, form and coefficients on the speed and power of ships; appendage resistance, models and model tanks; powering of paralleled bodied ships; propeller design and the influence of the hull on the action of the propeller. The work in rolling takes up a mathematical investigation of the rolling of ships in still water and among waves. Taylor's *Speed and Power of Ships*. Preparation required: 452. Second term (4).

454. MARINE ENGINEERING. The marine power plant and the layout of machinery on shipboard. Boilers, reciprocating steam engines, turbines, combination machinery, electric drive, and Diesel engines; fuels, combustion, draft and draft apparatus; condensing apparatus and ship auxiliaries. Chapman's *The Marine Power Plant*. Preparation required: 218. Second term (4).

455. SHIP DESIGN. Lectures and drawing-room work. In this course and course 456 each student carries through a design for assigned requirements which parallels the class-room work. In this design he works up the dimensions, coefficients, displacement, estimated weights and lines; stability under various conditions of loading; power and propeller requirements; layout of the power plant; freeboard and bulkhead subdivisions as

required by law; strength calculation; and cargo handling arrangements. Lectures covering the design of boats for inland water navigation. Preparation required: 450 to 454. First term (3).

456. Ship Design. A completion of the work of course 455. Lectures covering tonnage, flooding of compartments and some of the economic aspects of ship design and operation. Preparation required: 455. Second term (3).

457. Terminal Facilities. A study of the loading and unloading of ships, cranes, piers, transit sheds, warehouses and railroad facilities and the other factors involving a quick "turn-around" of a ship in port. MacElwee's *Ports and Terminal Facilities*. Second term (2).

458. Summer Work in Ship Construction and Marine Transportation. During the summer following the Sophomore and Junior years, students are required to spend at least eight weeks in a shipyard or at sea. (3).

459. Ship Operation. A study of the engineering aspects of ship operation. The relation of size and speed of ships for the most economical performance in service; a study of the operating expenses of ships with different types of propelling machinery on various trade routes; influence of stevedoring costs and turn-around on profits; comparison of operating expenses of the steamship and the motor ship. Numerous practical problems. Preparation required: 454 and 455. Second term (2).

MILITARY SCIENCE AND TACTICS

MAJORS LANG AND PATCH, CAPTAINS SHAMOTULSKI, BELL, BALDWIN,
HOLLINGSWORTH, LIEUTENANT GRAHAM, SERGEANTS
MADDEN, LAVIN, ALDERSON, BOYLE

An infantry unit of the Reserve Officers' Training Corps was established at Lehigh University in September, 1919. Conducted on a voluntary basis during the year 1919-1920, the unit had a membership of 313 students. A year later the Trustees and Faculty of the University made Military Science and Tactics a required subject, under the R. O. T. C. regulations, for physically fit Freshmen and Sophomores. Provision for this training is made in their schedule of study.

The military courses contemplated under the War Department regulations consist of two years of basic work and two years of elective advanced work along specialized lines. A student taking the courses for four years becomes eligible, upon graduation, for a commission in the Officers' Reserve Corps of the United States Army. Uniform and equipment, consisting of cap, coat, shirt, breeches, leggins, rifle, belt, and bayonet, are furnished by the Government. Musical instruments are also furnished to the members of the band. Each student having in his possession any government property is required to execute a bond for $50. During the advanced course students are paid commutation of subsistence, amounting to approximately $10 a month.

470. BASIC COURSE. Fundamental military training common to all arms of the service. Three hours a week, two theoretical and one practical. Theoretical instruction consisting of lectures, recitations, and quizzes on organization, infantry drill regulations, rifle markmanship, scouting and patrolling, physical training and military courtesy. Practical instruction given in infantry drill, target practice and ceremonies. First and second terms (1½).

470a. R. O. T. C. Basic Camp of six weeks, with report, for engineering students, except Naval Engineers (3).

471. BASIC COURSE. Second year. Three hours a week. Fundamental military training common to all arms. Fundamentals of map reading and military sketching, military hygiene, musketry, sanitation and first aid, command and leadership, automatic rifle, bayonet, and grenades. First and second terms (1½).

472. ADVANCED COURSE. Third year. Five hours a week. Field engineering, 37 mm. gun, light (Stokes) mortar, machine guns, military law, rules of land warfare, command and leadership, drill, marches, concealment and camouflage. First and second terms (3½).

472a. Summer R. O. T. C. Advanced Camp (3).

473. ADVANCED COURSE. Fourth year. Five hours a week. infantry drill, tactics, tactical walks, war games, military history of the United States, command and leadership, pistol markmanship, interior economy, and administration. First and second terms (3½).

Ample facilities for close order drill are afforded on Taylor Field. A twelve target, fifty and seventy-five foot, indoor range is located in the cage. A five target, fifty foot, range is located in Packer Hall basement; on the Mack Farm property is a four target outdoor range with firing points at 200, 300 and 500 yards. Intercollegiate team matches and intramural team matches are held from December 1 to May 1, both indoors and outdoors.

PHYSICAL EDUCATION

PROFESSOR REITER, ASSOCIATE PROFESSOR BALDWIN,
ASSISTANT PROFESSOR BARTLETT, MR. KANALY

The aim of the Department of Physical Education is to insure the health and physical development of every student of the University. Exceptional facilities for accomplishing this aim are afforded in Taylor Gymnasium, field house and the two playing levels of Taylor Field.

Each student, upon entering the University, is given a physical examination by the Department and also a medical examination by the consulting physician. He receives a plotted card showing his relation to the normal student and he is advised as to postural and physical defects. A second physical examination later is offered, to afford evidence of improved condition.

All students are required to take regular exercise under Department supervision. This requirement calls for two hours a week in the gymnasium, or participation, under the oversight of the Director, in one of the following organized sports: football, cross country running, basketball, wrestling, swimming, soccer, track, lacrosse, tennis and baseball. Members of the R. O. T. C. unit may substitute one hour of military drill for one of the two hours of required gymnasium.

500. GYMNASIUM. Class exercise in the open air, consisting of setting up work for current carriage. Work with dumb bells, wands, and Indian clubs to stimulate circulation, respiration, muscular action and to produce co-ordination and grace. Squad work on the heavy apparatus to develop strength in the larger muscles; recreative work in games and competitive exercises, to develop the play and combative elements. The various drills and athletic dances accompanied by music.

Instruction in boxing, wrestling and swimming. The swimming course includes the various swimming strokes, fancy diving and modern methods of life saving. A competent instructor is in charge. The measure of proficiency required of every student is swimming at least the length of the pool. Voluntary classes in advanced apparatus work. Talks given to the Freshmen on personal hygiene and the physiology of exercise. First and second terms; for Freshmen, Sophomores, (½), Juniors, Seniors, Graduate Students, (1).

CONFERENCE DEPARTMENT

PROFESSORS LAMBERT, PALMER, ULLMANN AND MAC NUTT

The Conference Department provides extra instruction in Mathematics, Modern Languages, Physics, and Chemistry for Freshmen and Sophomores.

Any student who wishes to clear up some difficulty in the Mathematics, Modern Languages, Physics, or Chemistry of the Freshman or Sophomore year, should consult the teachers in the Conference Department. Students may report at 7 o'clock any evening except Saturday. There is no fee for instruction in the Conference Department.

EXTENSION COURSES

The extension courses of the University are of collegiate grade. Below is the list of such courses offered. All courses marked "G" may be offered by graduate students toward the higher degrees; courses marked "g" may be so offered under conditions prescribed by the department offering the course, and with the express consent of the Committee on Graduate Courses. The letter "e" is used to indicate courses that are open to students not matriculated in the University.

PHILOSOPHY, PSYCHOLOGY AND EDUCATION

PROFESSOR HUGHES, ASSISTANT PROFESSOR DROWN

PHILOSOPHY. 1eg. HISTORY OF PHILOSOPHY. Leighton. (2) Evenings or Saturday.

PHILOSOPHY. 2e. THE RELIGION OF PHILOSOPHY. Plato, Spinoza, Kant, James. (2) Evenings.

PHILOSOPHY. 3e. ELEMENTARY LOGIC. Sellers. (2) Saturday A.M.

PHILOSOPHY. 4e. HISTORY OF SCIENCE. Libby. (2) Evenings.

PSYCHOLOGY. 1e. GENERAL PSYCHOLOGY. (2, 3 or 4) Afternoons.

PSYCHOLOGY. 2e. INTELLIGENCE. An introductory course in testing and developing intelligence. Dewey, Terman. (2) Evenings or Saturday.

PSYCHOLOGY. 3eg. MENTALITY OF SCHOOL CHILDREN. Advanced course in tests, surveys and clinical studies. (2) Evenings or Saturdays.

PSYCHOLOGY. 4eg. SOCIAL PSYCHOLOGY. Dewey, Wallas, (2) Evenings or Saturday.

EDUCATION. 1e. ELEMENTARY SCHOOL METHODS. (2) Evenings or afternoons.

EDUCATION. 2e. EDUCATIONAL MEASUREMENTS. The standard tests of achievement; how to use them. (2) Evenings or afternoons.

EDUCATION. 3eg. EDUCATIONAL MEASUREMENTS. Advanced course. Investigations and reports. (2, 3 or 4) Evenings, afternoons or Saturday.

EDUCATION. 4eg. THE PROJECT METHOD. Readings, reports, observation, experiment. (2 or 3) Evenings.

EDUCATION. 5 eg. SECONDARY EDUCATION. Introductory course. Colvin. (2) Evenings.

EDUCATION. 6eG. SECONDARY EDUCATION. Advanced course. Inglis, Monroe, Johnson. (2, 3 or 4) Evenings.

EDUCATION. 7eg. JUNIOR HIGH SCHOOL. Briggs, Douglas, and others. (2 or 3) Evenings.

EDUCATION. 8eg. SCHOOL ADMINISTRATION. Cubberly; State (2), City (2). Evenings or Saturday.

EDUCATION. 9eG. SEMINAR IN EDUCATION. Reports and discussions. Saturday.

EDUCATION. 10e. HISTORY OF EDUCATION. Rousseau's *Athens, the Renaissance;* American Schools, schools of today and of tomorrow. (3) Saturday or evenings.

EDUCATION. 11e. EDUCATIONAL SOCIOLOGY. (2) or (4) Evenings.

EDUCATION. 12e. CURRICULUM MAKING. (2) Evenings or Saturday.

ECONOMICS, PUBLIC LAW AND HISTORY

PROFESSOR STEWART, ASSISTANT PROFESSOR BROWN

ECONOMICS. 1eg. SOCIOLOGY. Sociological and economic theory, and problems to which this theory may be applied. (2)

HISTORY. 1e. INDUSTRIAL HISTORY OF THE UNITED STATES. Bogart's *Economic History of the United States;* Cressy's *Outline of Industrial History.* (2) Saturday.

HISTORY. 2eg. POLITICAL AND SOCIAL HISTORY OF MODERN EUROPE. Lectures and discussions. Special reference to the causes of the recent war. (2) Evenings.

LATIN

PROFESSOR WRIGHT

LATIN. 1e. A course corresponding to the work of the Freshman year in college. (2), (3) or (4). Evenings or Saturday A.M.

LATIN. 2eg. Advanced course in Latin Literature, suited to graduate students. Hour to be arranged.

FRENCH

PROFESSOR FOX, ASSISTANT PROFESSOR TOOHY

FRENCH. 1e. ELEMENTARY FRENCH. (3) Evenings or Saturday A.M.

FRENCH. 2e. ELEMENTARY FRENCH, continued. Reading and conversation course. (3) Evenings or Saturday A.M.

FRENCH. 3eG. RECENT FRENCH LITERATURE. Investigation and discussion of phases of French life as exemplified in French literature; rapid reading. (3) Tuesday, Thursday, Friday, 3:30 to 6 P.M.

SPANISH

PROFESSOR FOX, ASSISTANT PROFESSOR TOOHY

SPANISH. 1e. ELEMENTARY SPANISH. (3) Saturday A.M., on Tuesday, Thursday, Friday, 4:30 to 6 P.M.

SPANISH. 2e. ELEMENTARY SPANISH, continued. (3) Saturday A.M., or Tuesday, Thursday and Friday, 4:30 to 6 P.M.

GERMAN

PROFESSOR PALMER, ASSISTANT PROFESSOR MORE

GERMAN. 1e. ELEMENTARY GERMAN. German Grammar and Composition. Easy German Texts. (2) Saturday A.M.

GERMAN. 2e. INTERMEDIATE GERMAN. German Prose and Poetry. Heine, Keller, Meyer, Freytag, Storm, Heyse. (3) Saturday A.M.

GERMAN. 3e. Goethe's *Faust*, Part I, Lectures and Composition; or Nineteenth Century German Drama. (3) Saturday A.M.

GERMAN. 4eG. Goethe's Dramas, or Schiller's Life and Work, or Middle High German. (3) or (5) Afternoons, 4 to 6.

GERMAN. 5e. Teacher's Course in methods of teaching, discussion of text-books, phonetics of German, advanced German grammar and syntax, advanced composition. (2) Saturdays or afternoons.

ENGLISH

PROFESSOR LUCH, ASSISTANT PROFESSOR MESCHTER, MR. LAMBERT

ENGLISH. 1e. PUBLIC SPEAKING.

ENGLISH. 2e. CONTEMPORARY DRAMA.

ENGLISH. 3e. VICTORIAN LITERATURE.

ENGLISH. 4e. RHETORIC AND COMPOSITION.

ENGLISH. 5e. SHAKESPEAREAN DRAMA.

METALLURGY

ASSOCIATE PROFESSOR ROUSH, ASSISTANT PROFESSOR BUTTS

METALLURGY. 1e. GENERAL METALLURGY. (2) Evenings.

METALLURGY. 2e. METALLURGY OF IRON AND STEEL. (2) Evenings.

GEOLOGY

PROFESSOR MILLER, ASSISTANT PROFESSOR TURNER

GEOLOGY. 1e. GENERAL GEOLOGY. Lectures, field trips and laboratory. Study of geologic processes and results. (4) Saturday P.M.

GEOLOGY. 2e. GEOLOGY OF PENNSYLVANIA. Lectures, field trips and laboratory. Geological history of the State and its bearing on economic and political development. (4) Saturday P.M.

GEOLOGY. 3e. APPLICATIONS OF GEOLOGY to the teaching of Physical Geography. Illustrated lectures; discussion of school problems. (4) Evenings.

GEOLOGY. 4eG. The graduate courses listed on pages 143 and 144 may be pursued as extension courses by qualified students.

BIOLOGY

PROFESSOR HALL, MR. KREIDLER

BIOLOGY. 1eg. GENERAL BIOLOGY. Lectures, laboratory and discussions. (2), (3), (4) Saturday.

BIOLOGY. 2eg. COMPARATIVE ANATOMY. Lectures, laboratory and discussions. (2), (3), (4) Saturday.

BIOLOGY. 3eg. BACTERIOLOGY AND SANITARY BIOLOGY. Lectures, laboratory and discussions. (2), (3), (4) Saturday.

BIOLOGY. 4eg. EMBRYOLOGY. Lectures, laboratory and discussions. (2), (3), (4) Saturday.

BIOLOGY. 5eg. The graduate course listed on page 139 may be pursued as an extension course by qualified students. Afternoons, 4 to 6, or Saturdays.

BIOLOGY. 6eg. FORESTRY. Lectures, laboratory and discussion. (3) Saturday.

PHYSICS

PROFESSOR MAC NUTT,
ASSISTANT PROFESSORS FRAIM AND MARTIN

PHYSICS. 1e. ELEMENTARY PHYSICS. A brief general course; lectures, demonstrations, recitations and laboratory. (4) Saturday P.M.

ELECTRICAL ENGINEERING

PROFESSOR ESTY, ASSOCIATE PROFESSORS SEYFERT AND SCHEALER,
ASSISTANT PROFESSORS BEAVER, GRUBER AND ESHBACH, MR. MILLER

CONSTRUCTIVE ELEMENTS OF ELECTRICAL APPARATUS. 1e. Studies of electrical machinery and appliances with the object of familiarizing the student with principles of operation, structural details, and practical uses. (2) Evenings.

ELECTROTECHNOLOGY. 2e. Review of the principles of electricity and magnetism, with special reference to their application to dynamo electric machinery; the elementary theory of direct current generators and motors; automatic starters and controllers; rates and costs; practical operation of dynamos; station equipment; storage batteries. DYNAMO LABORATORY. Experimental studies and tests of direct current generators and motors for characteristics, regulation efficiency, etc. Laboratory fee, $6, in addition to a charge of $15 for the course. (3) Evenings.

ELECTROTECHNOLOGY. 3e. Theory of alternating currents with application to alternating current machinery and alternating current systems of transmissions, distribution and utilization; electric lighting. DYNAMO LABORATORY. Experimental studies and tests of alternating current generators and motors, synchronous converters, transformers, and auxiliary apparatus; measurement of power in polyphase circuits. Laboratory fee, $6, in addition to a charge of $15 for the course. (3) Evenings.

CHEMISTRY

PROFESSOR ULLMANN, ASSOCIATE PROFESSOR BABASINIAN

CHEMISTRY. 1e. ELEMENTARY CHEMISTRY, with laboratory. (2) or (4) Laboratory fee of $10, in addition to a charge of $10 for the single and $20 for the double course. A summer course only.

CHEMISTRY. 2e. ORGANIC CHEMISTRY. (2 to 4) Fee, $25, including laboratory. (3) or (4) Afternoon.

SUMMER SESSION OF EXTENSION COURSES

During the Summer of 1922 three of the fraternities upon the Campus were opened to extension students with good results. It is proposed, during the Summer of 1923, to open fraternities to women students, and to open a section of the dormitories to men students in the Extension Courses.

The following courses were given in 1922:

THEORY AND PRACTICE OF SPEECH CORRECTION	(6)
PSYCHOLOGY OF SPEECH CORRECTION	(2)
EDUCATIONAL PSYCHOLOGY	(4)
HISTORY OF PHILOSOPHY (Graduate)	(4)
MENTAL DIAGNOSIS	(4)
PRINCIPLES OF EDUCATION	(4)

The plans for the Summer session of 1923 have not yet been formulated. It is proposed to develop the laboratory studies to clinical and social phenomena that have been offered at the University for the past three years and thus to cooperate with the State Department in its efforts to promote the study of the social sciences in secondary schools.

Courses in several other departments of the University will be open to qualified students, including the departments of chemistry, geology, English, and modern languages.

The University Campus is a delightful place of residence, affording many opportunities of recreation, such as picnics, tennis, etc. It stands well above the river, and offers beautiful views of the neighboring hills and plains. The dormitories and fraternities are dignified and convenient in all their appointments.

Those interested in Summer Courses at Lehigh University should address the Director of Extension Courses after February 1, by which time it is hoped that the new circular for Summer Courses will be ready.

EVENING SCHOOL OF BUSINESS ADMINISTRATION

The Lehigh University Evening School of Business Administration was organized in the fall of 1920 for business men in the vicinity of the University who desire a knowledge of the fundamental principles of the economics of business. A three-year course is offered. Instruction is given three evenings a week, from 7:40 to 9:40 o'clock, by members of the teaching staff of the College of Business Administration.

Upon completing the course a student receives a certificate of proficiency. If he later enters the College of Business Administration, his Evening School credits will be accepted on an hour for hour basis.

The subjects of the Evening School of Business Administration are as follows:

First Year

Business Law 1. Contracts and Negotiable Instruments. The principles of contract; formation of contracts; operation and discharge of contracts; sales of goods; insurance contracts; principal and agent; master and servant; negotiable instruments.

Banking and Currency. A study of the banking system of the United States, comparing it with those of the important European states, together with a study of the currency and currency problems of this country. Special emphasis upon the Federal Reserve Act.

Accounting. A study of the fundamental principles of accounting with sufficient practice work to illustrate these principles. Theories of debit and credit; single and double entry; construction of accounts; special books; distinction between capital and revenue and the problems involved; construction and analysis of financial statements; equity accounts; valuation of assets; methods and problems of depreciation. Emphasis on the economy aspects of accounting.

Economics. Lectures on economics, supplementing the other work of the school; optional.

Second Year

Business Finance (2 Years). An exposition of the essential principles of sound financing; the different forms of financial organization; stocks and bonds; sale of securities, promotion and underwriting; financial management and irregularities and mismanagement.

Law of Business Organization. A study of the various forms of business organization, as the single proprietorship, the partnership, and the corporation.

Corporation Accounting. The application of accounting principles to corporations, corporation accounts and records. The voucher system; construction and analysis of corporation statements and reports; assets of corporations and their valuation; capital stock and the stock books; bonds and other forms of indebtedness; distribution of profits; handling surplus and reserves; sinking and other funds; liquidation of a corporation; combinations and consolidations; branch house accounting. Considerable practice work. Problems selected largely from examinations for Certified Public Accountancy.

Third Year

(Three subjects to be chosen.)

Auditing.
Manufacturing Accounts.
Industrial Administration.
Economics.
Law.
Investments.
Government Regulation of Business.
Advertising.
Foreign Trade.
Insurance.

A circular giving entrance requirements, fees and other details may be obtained by addressing the Registrar of Lehigh University.

SUMMER TERMS

Summer courses are required as indicated in the foregoing schedules of courses. Students not connected with the University may be admitted to summer courses if properly qualified.

GRADUATE COURSES

Courses leading to the degree of Master of Arts or Master of Science may, by permission of the Faculty, be pursued by any properly qualified person who has taken the Bachelor's degree or a degree in technology at any recognized college, university or technical institution. These courses require at least one year of advanced study in residence at Lehigh University in two departments (under two professors), or at least two years of such study in non-residence. Residence is construed as continuous attendance at the University and living under its jurisdiction. Permission to enroll for study in non-residence will be granted only in exceptional cases to students who possess ample facilities for study and work and usually only to students who can report periodically in person for conferences with the professors under whom they are studying.

The course of study selected must consist of at least fifteen exercises a week. Two-thirds of the work, ten hours a week, including a thesis, if required, must be chosen in one department called the major department. The work in the major department is to be selected from the list of graduate studies. About one-third of the work is to be in another department, called the minor department, and may be chosen from the list of graduate studies or from other advanced courses offered by the University. In special cases, on recommendation of the Committee on Graduate Studies, a student may be permitted to take both major and minor courses in the same department provided the subjects are taken under two professors and are of distinctly different nature. The candidate is required to satisfy each professor concerned that he is fully competent to pursue the subjects selected.

Candidates may be enrolled at any period of the college year, but preferably at the beginning of the regular terms in September and February.

The fees for instruction are $100 a year for students in residence, and $50 a year for students in non-residence, payable in advance. Fees for students in residence are payable in two instalments of $60 and $40 at the beginning of the first and second terms respectively. A student in residence who takes more than one year shall have returned to him a pro-rata part of his payment for the second, or other succeeding years, if he finishes in a fraction of that year. A student in non-residence shall pay for the first two years; no fee will be required for the third year, but succeeding years, if necessary and permitted by the Faculty, shall be paid for at the rate of $50 a year. The graduation fee of $10 is required of all students.

After passing examinations in the assigned studies, presenting a satisfactory thesis as evidence of ability to do original work, if required by the professor concerned, and paying all required fees, the candidate will be recommended by the Faculty to the Trustees for the Master's degree appropriate to the course pursued.

Some of the University Extension Courses listed on page 129 are designated as graduate courses. As these are given late in the afternoon, or in the evening, or on Saturdays, they are especially adapted to teachers and others who are enrolled as graduates in non-residence.

The following graduate studies are now offered by the University.

MATHEMATICS AND ASTRONOMY

PRACTICAL ASTRONOMY

PROFESSORS THORNBURG AND OGBURN

The study of instruments and methods used in the determination of time, latitude, longitude and azimuth; practical work in the observatory, securing facility in making and reducing observations. Two terms (5).

DIFFERENTIAL EQUATIONS

PROFESSOR LAMBERT

Course in Differential Equations based on Johnson's *Differential Equations* and Byerly's *Spherical Harmonics.* Collateral reading in the University Library required. Two terms (3).

ANALYTIC MECHANICS

ASSOCIATE PROFESSOR REYNOLDS

Elementary and Advanced Rigid Dynamics; Potential Functions, based on Love's *Theoretical Mechanics;* Williamson and Tarleton's *Dynamics;* and Routh's *Dynamics.* Two terms (3).

DIFFERENTIAL GEOMETRY

ASSISTANT PROFESSOR KNEBELMAN

Parametric representation of plane and skew curves and surfaces, theory of contact, curvature, differential invariants, intrinsic equations, trajectories, equations of Césaro, curvilinear coordinates, equations of Lamé. Representation of one plane upon another, conformal and spherical representation, equations of Gauss and Godazzi, theory of applicability. Two terms (2).

THEORY OF EQUATIONS

ASSOCIATE PROFESSOR STOCKER

An elementary and advanced course in Theory of Equations, based on the treatise by Burnside and Panton. Two terms (2).

INTEGRAL CALCULUS

ASSOCIATE PROFESSOR STOCKER

A course in advanced integral Calculus, including Elliptic Integrals, based on the works of Byerly and Williamson. Two terms (2).

ENGLISH

ENGLISH LITERATURE

PROFESSOR THAYER

An advanced course in branches which have not formed a part of the undergraduate work of the candidate, details to be arranged after a personal conference. Two terms (5).

ANGLO-SAXON

ASSISTANT PROFESSOR MESCHTER

Anglo-Saxon poetry and prose above the grade of undergraduate work, from both the literary and the historical points of view. Two terms (5).

ENGLISH PHILOLOGY

PROFESSOR LUCH

An advanced course in the principles of Teutonic philology as applied to the origin and development of the English language. Two terms (5).

MODERN POETRY

ASSISTANT PROFESSOR MESCHTER

Poetry of the Twentieth Century, in matter, metre and diction. Present tendencies. One term (5).

SANSKRIT

PROFESSOR THAYER

Beginner's Course. Perry's *Primer*. Lanman's *Reader*. Whitney's *Grammar*. Two terms (5).

ECONOMICS AND HISTORY

POLITICAL ECONOMY

PROFESSOR STEWART

The rise and development of economic systems and economic thought; the scope and method of political economy. Patten's *Development of English Thought* and the works of Keynes, Cohn and Ingram on political economy are used. Two terms (5).

FINANCE

Advanced course in Finance, with special reference to study of a financial system. Adapted to the peculiar requirements of the Federal and local government of the United States. Two terms (5).

AMERICAN HISTORY

PROFESSOR STEWART

An examination of the influence of the economic development of the Union upon the legal and political theories incorporated in the Constitution. Two terms (5).

POLITICS

PROFESSOR STEWART

The history of the attempt to treat in a systematic way the problems of political organization. Pollock's *History of the Science of Politics* and Sidgwick's *Elements of Politics*. Two terms (5).

ACCOUNTING AND BUSINESS FINANCE

ASSOCIATE PROFESSOR BICKLEY

AUDITING. Procedure in conducting an audit; detection of errors and defalcations; financial conditions of business as revealed by the accounts and other sources of information. The social and legal responsibilities of auditing. First and second terms (3).

COST ACCOUNTING. The various systems of manufacturing accounts for different types of manufacturing enterprises; choice of methods to meet peculiar needs; installing cost systems; forms and records; manufacturing accounts as an aid to and as a check on production efficiency; preparation of reports for executives. First and second terms (3).

Accounting Systems. A study of the accounting systems of various types of business and other organizations. First and second terms (3).

Advanced Accounting Problems. This course covers the whole field of accounting and is based primarily on the requirements for the certified Public Accountant examination. The work consists largely of problems selected from certified Public Accountant examinations. First and second terms (3).

Business Finance. This course deals with the organization and financial problems of both large and small business enterprises, and with the factors that enter into the permanency of business organization. The course is intended to break down the division of business into subjects and to correlate the work of other courses in business and to serve as a focusing point for the specific application of business principles. First and second terms (3).

GREEK

Advanced courses, of which the following are specimens, will be arranged upon application:

HELLENISTIC GREEK

PROFESSOR GOODWIN

Gospel of St. Mark, *Acts*, and selected *Epistles of the New Testament*. Thayer's *Lexicon.* Blass's *Grammar of New Testament Greek.* Patristic literature. Collateral reading. Selections from Lucian. Two terms (5).

DRAMATIC POETRY

PROFESSOR GOODWIN

Several plays of Aeschylus, Sophocles, Euripides, and Aristophanes. Aristotle's *Poetics*. Collateral reading. Two terms (5).

GREEK PHILOSOPHY

PROFESSOR GOODWIN

Plato's *Republic* and other works. Aristotle, selections. Ritter and Preller's *Historia Philosophiae Graecae.* Zeller's *History of Greek Philosophy*, and other collateral reading. Two terms (5).

ELECTRICAL ENGINEERING

THEORY OF ALTERNATING CURRENTS AND ALTERNATING CURRENT MACHINERY

PROFESSOR ESTY

A course based upon the works of Arnold, Bedell and Crehore, Fleming, Steinmetz and Lawrence. Two terms (4).

ELECTRICAL DESIGN

PROFESSOR ESTY

A course consisting of predeterminations by calculation of the characteristics, regulations and performance of electrical machinery. Analysis and use of designing constants. Design of special machines. Two terms (3).

ELECTRIC TRACTION

PROFESSOR ESTY, ASSISTANT PROFESSOR ESHBACH

The development of an electric railway project. Design of station and distribution system. Operating characteristics of direct and alternating curent railway motors. Predetermination of motor equipment and run curves for given schedules and traffic. Choice of system. Estimates of costs. Two terms (3).

ELECTRICAL TESTING

PROFESSOR ESTY, ASSOCIATE PROFESSOR SEYFERT

Special experimental research in electrical engineering; tests of the magnetic properties of iron and steel; investigation of the series single-phase alternating current motor; leakage reactance of induction motors; regulation of alternators; polyphase testing; electric railway testing. Two terms (3).

RADIO COMMUNICATION

PROFESSOR ESTY, ASSOCIATE PROFESSOR SEYFERT

The theory underlying the various sending and receiving systems, and the propagation of electromagnetic waves, combined with experimental work in connection with the department's wireless equipment. Two terms (2).

MINING ENGINEERING

METHODS OF MINING

PROFESSOR ECKFELDT

The study of methods used in a given mining region, or in the production of a given class of material, with respect to conditions influencing choice of method and cost. Two terms (5).

MINING PLANT

PROFESSOR ECKFELDT

The determination of the efficiency of mining machinery of given types under varying conditions. Two terms (5).

ORE DRESSING PLANT

ASSOCIATE PROFESSOR BARTLETT

The study of certain operations incident to the dressing of ores or the preparation of coal. Determination of efficiency of machines and processes. Losses in dressings. Two terms (5).

GERMAN

PROFESSOR PALMER, ASSISTANT PROFESSOR MORE

The German Drama of the Nineteenth Century. First and second terms (3).

Lessing as Dramatist and Critic. First and second terms (3).

Middle High German. Wright's *Middle High German Primer*, Bachmann's *Mittelhochdeutsches Lesebuch*, Nibelungenlied. First term (3).

Middle High German. Gudrun, Wolfram von Eschenbach, Gottfried von Strassburg, Walter von der Vogelweide. Lectures on Middle High German literature. Second term (3).

GEOLOGY

GEOLOGICAL INVESTIGATION

PROFESSOR MILLER

The investigation and study of the literature of some special geological problem. Field and laboratory work on some district; map of a limited area; an investigation of the microscopic character and general structural features of the rocks which are exposed; presentation of a thesis or dissertation embodying these results. Preparation required dependent upon the nature of the problems to be studied. Two terms (4).

ECONOMIC GEOLOGY

PROFESSOR MILLER

Advanced work in ore deposits. Study of the literature and of the theories of ore deposition, together with detailed work on the type occurrences of some of the metallic or non-metallic minerals. Thorough investigation and report on some mining district with special regard to the origin of the ores and such commercial aspects of the deposits as may depend chiefly on the geology. Preparation required: 270 or 271. Two terms (6).

PETROGRAPHY

ASSISTANT PROFESSOR TURNER

A critical study of recent advances in petrographic methods and nomenclature. Preparation of a detailed report on a selected problem. Preparation required: 266, 268, 269 and 276. Second term (3).

PHYSIOGRAPHY

PROFESSOR MILLER

The detailed study of physiographic types and processes. Conferences, reports and thesis, with work in the laboratory and field. A training in elementary physiography and general geology required as a pre-requisite. Two terms (4).

PHYSICAL CRYSTALLOGRAPHY

ASSISTANT PROFESSORS TURNER AND FRETZ

An advanced course in the geometrical and physical properties of crystals, with special reference to the Goldschmidt methods of crystal measurement and projection. First term (4).

BIOLOGY

PROFESSOR HALL

Advanced courses, of graduate grade, may be arranged in comparative anatomy, vertebrate embryology and bacteriology. Other courses, covering such subjects as the history of biology, genetics, etc., which do not involve laboratory work, may also be arranged.

VERTEBRATE HISTOGENESIS AND ORGANOLOGY

Careful following, in the laboratory, of the development of a vertebrate, tracing of the history of the germ-layers, organs and tissues. Organology dealing with the association of tissues to form organs. Preparation required: 292, 293, 294. First term (3).

PHILOSOPHY, PSYCHOLOGY AND EDUCATION

PROFESSOR HUGHES, ASSISTANT PROFESSOR DROWN

The following undergraduate courses may count toward an advanced degree provided additional work is taken in connection with them: History of Philosophy, ancient and modern, History of Education, Educational Psychology, Problems of Secondary Education. More advanced courses in Psychology, Logic, Ethics and Metaphysics may be outlined to meet the needs of competent students.

The following is the course that commonly is followed by those who select Education as the major study. Educational Psychology, two year hours; School Administration, two year hours; Secondary Education, two year hours; Seminar in Education, with Thesis, four year hours. Most students in the field of Education find it convenient to avail themselves of the Extension Courses, which are listed on page 129.

GRADUATE COURSES

1. History of Philosophy, advanced course. (3)
2. Plato. More's Platonism and the Religion of Plato. (3)
3. The Philosophy of History. Augustine, Kant, Hegel, Comte, Spencer, Wells. The economic interpretation of history. The meaning of evolution. (4)
4. The Theistic Argument. (2)
5. Thesis in Philosophy. (2 to 5)
6. Educational Psychology. (2 to 5) Offered only as a minor.
7. Social Psychology. (2 or 4)
8. Educational Measurements. (2 or 4)
9. Secondary Education. (2 or 4)
10. School Administration; State and County. (2)
11. School Administration; City. (2)
12. Educational Sociology, advanced. (2)
13. Junior High School. (2)
14. Curriculum Making. (2)
15. Project Method. (2)
16. Seminar and Thesis in Education. (2 to 5)

Students who elect a major in this department will so arrange their course that some part of their work will be conducted under the second professor in the department.

FRENCH

LITERATURE

PROFESSOR FOX, ASSISTANT PROFESSOR TOOHY

An advanced course in French Literature. The course is arranged with each candidate individually upon application. Two terms (5) or (10).

LANGUAGE

PROFESSOR FOX, ASSISTANT PROFESSOR TOOHY

A. OLD FRENCH. Grammar. Easier texts. Chanson de Roland. First or second term (2) or (3).

B. OLD FRENCH. Reading and explanation of texts. First or second term (2) or (3).

C. ROMANCE PHILOLOGY. Sound change. Word formation. First or second term (2) or (3).

D. ROMANCE PHILOLOGY. Syntax. First or second term (2) or (3).

SPANISH

LITERATURE

PROFESSOR FOX, ASSISTANT PROFESSOR TOOHY

An advanced course in Spanish Literature. First or second term (2) or (3),

LANGUAGE

PROFESSOR FOX

OLD SPANISH. Grammar. Readings. First or second term (2) or (3).

ITALIAN

PROFESSOR FOX

Dante's *Inferno*. Lectures and outside reading. First or second term (2) or (3).

CHEMISTRY

INDUSTRIAL CHEMISTRY

PROFESSOR ULLMANN, ASSOCIATE PROFESSOR CHAMBERLIN

Study of some industry dependent upon chemical principles, consisting of experimental and analytical work in the laboratory and study of the technical journals and other publications. Two terms (10).

ORGANIC CHEMISTRY

PROFESSOR BABASINIAN

Original investigations in organic chemistry. Two terms (10).

ANALYTICAL CHEMISTRY

PROFESSOR ULLMANN, ASSOCIATE PROFESSOR DIEFENDERFER

Study and comparison of known methods of quantitative analysis and the development of new methods. Two terms (10).

INORGANIC CHEMISTRY

ASSOCIATE PROFESSOR LONG, ASSISTANT PROFESSOR OPDYCKE

Original investigations in inorganic chemistry. Two terms (10).

PHYSICAL CHEMISTRY

ASSISTANT PROFESSOR EWING

Original investigations in physical chemistry. Two terms (10).

PHYSICS

THEORETICAL PHYSICS

PROFESSOR MAC NUTT,

ASSOCIATE PROFESSOR FRY, ASSISTANT PROFESSOR KLEIN

Heat and Thermodynamics. The aim of this course is to present a comprehensive account of the Science of Heat and to develop the consequences of the two fundamental laws of Thermodynamics. First and second terms (3) to (5).

The Theory of Electricity and Magnetism. An introductory discussion of the theorems in electrostatics of Gauss, Poisson, Laplace, and their applications. Maxwell's theory of the electro magnetic field and electro magnetic waves followed by the Electron Theory of Lorenz as applied to Electricity and Magnetism. First and second terms (3) to (5).

The Theory of Light. This course is based upon the works of Preston, Drude, Wood, etc. First and second terms (3) to (5).

PHYSICAL RESEARCH

PROFESSOR MAC NUTT, ASSISTANT PROFESSOR KLEIN

Opportunity afforded advanced students to pursue experimental investigations in physics. First and second terms (2) to (4).

CIVIL ENGINEERING

BRIDGE DESIGN

PROFESSOR FOGG

The theory of suspension and arched structures, with the preparation of general plans and estimates, and the economic comparison of different types. Two terms (4).

TESTING OF MATERIALS

PROFESSOR FOGG, ASSISTANT PROFESSOR FULLER

The properties of materials of construction, with special reference to inspection and testing. Original researches by the student in the laboratory. Detailed attention to the work on the unification of methods of testing done by the International Association for Testing Materials. Two terms (5).

RAILROAD ENGINEERING

PROFESSOR WILSON

The economic location of railroads, as influenced by probable volume of traffic and cost of operation. A course based on Wellington's treatise, with detailed discussion of special cases. Two terms (2).

SANITARY AND HYDRAULIC ENGINEERING

ASSISTANT PROFESSOR PAYROW

The designing of reservoirs, tanks, and pipe lines for water supply systems, and of sewers and other appurtenances for sewerage systems. Inspection of existing plants, with reports thereon. Two terms (4).

NAVAL ENGINEERING

ADVANCED SHIP DESIGN

PROFESSOR CHAPMAN

Advanced work in the design of cargo and passenger ships. The relation of size and speed of ships for the most economical performance in service; a study from actual layouts of the relative merits of various types of propelling machinery; subdivision and flooding calculations according to the rules of the Bulkhead Committee of the Board of Trade.

The design of special types of ships and sailing yachts. Two terms (5).

THE POWERING AND PROPULSION OF SHIPS

PROFESSOR CHAPMAN

An advanced course consisting of a study of powering and propeller data and a comparison of the work of various investigators. Two terms (2).

THE STRENGTH OF SHIPS

PROFESSORS FOGG AND CHAPMAN

Investigation of the stresses set up in a ship's structure with particular application to special types of construction. Two terms (3).

LATIN

PROFESSOR WRIGHT

An advanced course in the Latin language and literature or in one of the branches of Roman antiquities, arranged with each candidate individually on application. Two terms (5).

METALLURGY

THERMO-CHEMISTRY AND THERMODYNAMICS OF THE METALS

ASSOCIATE PROFESSOR ROUSH

A study of the melting points, vapor tensions, specific heats, and latent heats of fusion and of vaporization of the metals, from practical and theoretical viewpoints; also, of the heats of formation of compounds of the metals, and the relation of these to atomic weights and other chemical and physical properties. Lectures and laboratory work. First term (5).

THERMO-CHEMISTRY AND PHYSICS OF METALLIC ALLOYS

ASSOCIATE PROFESSOR ROUSH

A study of the physical and chemical properties of metallic alloys, their melting points, specific heats, latent heats of fusion, heats of formation and microscopic structures. Lectures and experimental work. Second term (5).

ELECTROMETALLURGY

ASSOCIATE PROFESSOR ROUSH

A study of the conditions of deposition of metals and alloys in electrolysis, electrolytic separations, formation of metallic compounds by electrolysis, energy absorption in electrolysis. Lectures and laboratory work. First term (5).

TUITION AND OTHER FEES

The tuition fees are as follows: In the College of Engineering, $300 for the year or $180 for either term; in the College of Business Administration, $250 for the year or $150 for either term; in the College of Arts and Science, $200 for the year or $120 for either term.

The tuition for Chemistry offered in the Summer term immediately following Commencement Day is $25; for all other subjects, $30. No charge is made for such subjects to students who have paid tuition for the previous year, provided the subjects in question are a scheduled part of the technical courses they are pursuing. A graduation fee of $10 is paid by all candidates for a degree. A registration fee of $10 is paid by each student yearly.

All fees are payable at the office of the Bursar in Drown Memorial Hall. Tuition fees are payable in two instalments, on the opening day of the college year in September, and on the first day of the second term in February. The first instalment is $180, or $150, or $120, according to the course, and the second instalment is $120, or $100, or $80, according to the course. Application may be made for a return of part of the tuition fee if a student has formally withdrawn from the University after less than fours weeks' attendance in either term, but the amount thus refunded will in no case exceed one-half of the last instalment paid.

Students who fail to pay tuition fees when due will be notified that their attendance at college exercises must be discontinued until payment is made.

EXPENSES

Books, stationery, and drawing instruments may be bought by students at low prices at the Supply Bureau in Drown Memorial Hall. For work in the laboratories, materials may be obtained from the University, students paying a fee or making a deposit at the opening of the term covering the value of the materials. The amounts of these deposits are given under the detailed statements of laboratory courses in the List of Studies.

The University dormitories accommodate 171 students. The charge for single rooms is $80 a year; suites of three or four rooms rent at $100 for each occupant.

Students may obtain table board at the College Commons. The rate is $25 for thirty consecutive days. Numerous private householders in the city offer rooms and board at moderate charge.

Necessary expenses for the collegiate year, clothing and traveling not included, are estimated at $600 in addition to tuition. This includes attendance at the required summer schools.

SITE

Bethlehem is situated at the junction of the Lehigh Valley, the New Jersey Central and the Philadelphia and Reading Railroads. The University buildings are about a half-mile from the station. New York is eighty-six and Philadelphia fifty-seven miles distant.

BUILDINGS AND GROUNDS

The University occupies nineteen buildings, and its grounds cover 180 acres on the north side of South Mountain, overlooking the valley of the Lehigh River and the city of Bethlehem.

PACKER HALL

Packer Hall, completed in 1869, is four stories in height, 215 feet long, and 60 feet wide. It is built of Potsdam sandstone in the English Gothic style of architecture.

The Department of Civil Engineering occupies the greater part of the first and second floors of Packer Hall. On the first floor are a lecture room, two recitation rooms, a large drawing hall, two instrument rooms, two offices and a library room. The instrument rooms contain seventeen transits, fourteen levels, a large geodetic theodolite, two plane tables and other instruments for engineering field work. In the library room is a collection of plans of engineering structures. On the second floor are two drawing-rooms, three recitation rooms, an instrument room, a blue-print room, and offices.

On the third and fourth floors are to be found the offices and recitation rooms of the Department of Mathematics and Astronomy.

In the basement are located the store rooms and gallery range of the Department of Military Science and Tactics.

The offices of the President, Vice-President, Secretary of the Faculty and Registrar are on the second floor of Packer Hall.

THE WILLIAM H. CHANDLER CHEMICAL LABORATORY

The Chemical and Metallurgical Laboratories are contained in a fire-proof sandstone building, 259 feet in length by 44 in width, with two wings, each 62 feet in length by 42 feet in width.

In the Chemical department there are two principal stories, a basement and a topmost story given over to the laboratory for physical chemistry. The upper floor is occupied by the quantitative and the qualitative chemical laboratories. These rooms are 22 feet in height, and are well lighted and ventilated. Laboratories for research chemistry and the supply room are also on this floor.

The first floor contains a large lecture room, a smaller lecture room, a recitation room, a chemical museum, and laboratories for organic chemistry and sanitary chemistry.

In the basement is a large laboratory for the furnace assay of ores and a well appointed laboratory for gas analysis; also rooms containing the apparatus for processes in industrial chemistry, steam engine and dynamo and motor installation, air pump for pressure and vacuum filtration, etc.

The University has recently completed an extenison of the Chemical Laboratory. It is three stories high, in architectural conformity with the main building, and has inside dimensions of 60 feet by 37 feet. The equipment of these laboratories is of the most modern type, and every accessory to comfort and efficiency in expediting laboratory work is provided.

The Metallurgical department contains a lecture room; a museum of metallurgical collections; an extensive departmental library; a dark room for photographic work; a laboratory provided with a spectroscope, two Le Chatelier and one Leitz metallographic microscopes complete with camera; a dry laboratory provided with gas and electric furnaces, and electric current for electrometallurgical experiments. Equipment is provided for laboratory work in metallurgy, metallography, and particularly in electrometallurgy, consisting of gas, electric current and apparatus for various kinds of experimental work. Several new pyrometers, calorimeters, and furnaces have been added recently to the general equipment. This department is therefore equipped for the instruction of classes in metallurgy and electrometallurgy of the regular curriculum, to afford facilities to students for familiarizing themselves with the methods of measurement and research employed in metallurgy and electrometallurgy, and for conducting original investigation in these departments of science.

The Trustees of the University named this building The William H. Chandler Chemical Laboratory in recognition of Dr. Chandler's thirty-five years' service as Professor of Chemistry, 1871-1906.

THE PHYSICAL AND ELECTRICAL ENGINEERING LABORATORY

The Physical and Electrical Engineering Laboratory is 240 feet long, 44 to 56 feet wide, and four stories high. The halls and stairways, the photometer rooms, and all apparatus rooms are of fire-proof construction. The remainder of the building is of heavy mill construction.

On the first floor are the Advanced Electrical Laboratory and shops of the Physics Department, the Senior and Junior dynamo laboratories, the shop and research room of the Electrical Engineering Department, and a storage battery room belonging jointly to the Departments of Physics and Electrical Engineering.

The dynamo laboratory for Senior students in the west wing is supplied with power from a 75-kilowatt rotary converter receiving current from the University power plant through two 30 kilowatt transformers. The dynamo laboratory equipment, which is being constantly increased, now includes the following apparatus: an 18-kilowatt double current generator, two direct current motor-generator units, one Lincoln variable speed motor, a 4-kilowatt Westinghouse two-phase rotary converter, a 10-kilowatt General Electric six-phase compound rotary converter, two direct connected units consisting of 7½-kilowatt six-phase General Electric alternators driven by 15-horse power Allis-Chalmers motors, one 20-kilowatt two- (or three-) phase alternator built by the Department, a 35-kilowatt

Westinghouse single-phase alternator, a 10-kilowatt composite wound alternator driven by a 15-horse power Crocker-Wheeler motor, a pair of 3-horse power direct connected series crane motors, three motor-generator sets converting from alternating to direct current, four polyphase induction motors ranging from 2-horse power to 7½-horse power, three types of single-phase induction motors, two single-phase commutator motors, twenty-two transformers of from 1 to 15-kilowatts, including two 15-kilowatt Scott-connected transformers, a 5-kilowatt 66,000-volt testing transformer, a 6-light constant current transformer, a 30-ampere arc rectifier outfit complete, a General Electric oscillograph outfit, a Crane lecture room oscillograph, and a variety of instruments, including voltmeters, ammeters, watt-meters, rheostats, contact makers, frequency meters, dynamometers, condensers, and other apparatus.

The dynamo laboratory for Junior students on the first floor in the west wing contains the following apparatus: a 20-kilowatt Ferranti alternator driven by a direct current motor, two arc light machines, twenty arc lamps of various types, a Brackett cradle dynamometer, a Westinghouse two-phase rotary converter, a motor driven battery-booster set, several types of adjustable speed motors, and other motors for direct and alternating currents.

On the second floor are the offices of the Departments of Physics and of Electrical Engineering, two general apparatus rooms, a large laboratory room for Physics, the Library of the Department of Physics and a small research laboratory, a large dynamo laboratory for Sophomore students in Electrical Engineering, and an Electrical Engineering reading room. The dynamo laboratory for Sophomore students in the west wing is equipped with twenty-seven direct current machines of various types, dynamotors and several types of automatic starters and auxiliary apparatus. Apparatus exemplifying the operation of telegraph, telephone, and radio telegraph and telephone stations are here installed. The equipment in radio telegraphy and telephony includes a 250-foot antenna, 5-kilowatt transformer, oscillation transformer, a 3000-volt direct current generator, quenched gap, and several sets of receiving apparatus.

On the third floor are the lecture room, apparatus rooms and photometer rooms of the Department of Physics, and lecture room, recitation rooms, apparatus room, and radio laboratory of the Department of Electrical Engineering.

On the fourth floor are recitation rooms and two large laboratory rooms of the Department of Pyhsics.

THE W. A. WILBUR ENGINEERING LABORATORY AND POWER HOUSE

The W. A. Wilbur Engineering Laboratory was erected in 1902; in 1907 the original building was doubled in size, the addition containing the new heating and lighting plant of the University. The building is of sandstone, conforming in material to the adjacent Chemical and Physical Laboratories. It is 44 feet wide by 188 feet long, one story high in the boiler room, but with a raised engine room forming a second story at either end.

The boiler equipment of the laboratory consists of two water-tube boilers rated at about 100-horse power each, one of Babcock & Wilcox, the other of Sterling type. In the heat and light plant there are three 250-horse power Sterling boilers, with room for a fourth unit of equal or greater capacity. Each section has its own set of feed pumps and other auxiliaries, in the arrangement of which special provision has been made for easily conducting performance tests. The laboratory boilers are connected to the chimney of the old boiler house, and have also an induced draft outfit. The chimney of the newer plant is of radial brick construction, 125 feet high, and a forced draft equipment is to be installed when need for increased capacity arises.

A coal-storage yard north of the building has room for a season's supply of coal, and a system of belt-conveyors and bucket-elevators is provided for receiving coal, dumping it on storage pile, and conveying it into the boiler room as needed.

The engine room of the laboratory, 50 feet long, contains a vertical triple-expansion engine of 75-horse power, a 60-horse power compound two stage Ingersoll air compressor, a small tandem-compound yacht engine, a simple Ball engine direct connected to a 25-kilowatt Crocker-Wheeler generator, and a 5-horse power De Laval steam turbine. There is also a complete set of Westinghouse airbrake apparatus, with four freight car brakes. The airbrake pump and all the other small motors, including the feed and condenser pumps, are piped to the surface condensers beneath the engine room floor. There are two large condensers of 150- and 60-horse power capacity respectively, with smaller ones for the pumps and for special experiments. Besides the various engines there is a large belt dynamometer, apparatus for testing gages, indicators, thermometers, steam calorimeters and other instruments, and for experiments on flow of steam, for testing injectors, etc. The exhaust system includes a Cochrane feed-water heater of 250-horse power capacity.

The engine room of the power house is 31 feet long, with concrete floor. The generating units now installed are of 50 and 100-kilowatt rating, and there is room for a third of larger size. Simple horizontal Ball engines are direct connected to General Electric alternating current generators, which furnish 60-cycle two-phase current at 2200 volts for transmission to the various distributing centers. An engine-driven and a motor-driven exciter, with the switchboard, complete the electrical equipment. The engines exhaust through a Cochrane heater, and the exhaust steam may be discharged directly into the low-pressure system during the heating season.

A floor space 45 feet by 70 feet in the old boiler house is now used as a laboratory. It contains a 150-horse power suction gas producer for anthracite coal and apparatus for gas-power engineering and hydraulics, and for minor thermodynamic experiments with steam.

This building bears the name of Mr. W. A. Wilbur in grateful recognition of the work he has done for Lehigh University.

WILLIAMS HALL

Williams Hall was the donation of Dr. Edward H. Williams, jr., of the Class of '75, and was so named by the Trustees of the University not only in recognition of this gift but also of Dr. Williams' long continued and important service to the University as an alumnus and as Professor of Mining and Geology.

Williams Hall is 186 feet long by 70 feet wide and covers a ground area of over 12,000 square feet. One-half of the building is devoted to the Department of Mechanical Engineering and the other half to the Departments of Geology and Biology.

In the eastern end there are recitation rooms, instructors' offices, drawing-rooms, reference library, and store-rooms of the Department of Mechanical Engineering, and in the basement rooms and apparatus are provided for laboratory work in experimental mechanics and engineering physics, such as the calibration of the measuring instruments used in Mechanical Engineering, the determination of the mechancal efficiencies of hoisting and other gear, and the testing of motors. In this section there are electric motors, a water motor, a 15-horse power centrifugal pump, hoists, blocks, jacks, and dynamometers of various kinds.

In the west end the Department of Geology has on the first floor two lecture rooms, two offices, library, mineralogical museum, and laboratory of petrology and petrography. The lecture rooms contain specimens of rocks and fossils and a collection of economic minerals and ores. The main lecture room is fitted with a stereopticon for illustrated lectures. The laboratory of petrography is provided with fifteen high-grade petrographic microscopes, and study collections of rocks and minerals. The collection of rocks contains over six thousand specimens from type regions in different parts of the world. The mineralogical museum contains many valuable collections representing all the prominent mineral localities in the world. In the basement are the mineralogical laboratory, the blowpipe analysis laboratory, a small chemical laboratory for analytical work, and a room fitted with apparatus run by a one-horse power motor for cutting thin sections of rock. On the second floor is the paleontological museum, which contains the fossil collections. On the third floor is a room fitted as an office and laboratory, containing a Goldschmidt's two-cycle goniometer and other apparatus for advanced work in crystallography.

On the third floor there are the drawing room and an office of the Mining Department, also well-equipped blue-print and dark rooms and a photographic laboratory used jointly by the Departments of Mining and Geology.

The Department of Biology has its lecture room, office, reference library, laboratories, and store rooms on the second floor, and a large vivarium on the third floor. The laboratories of this Department are thoroughly equipped with collections, sections, microscopes and necessary appliances.

Two students' rooms, used by the Mining and Geological Society and by the Mechanical Engineering Society, are located in the basement.

THE FRITZ ENGINEERING LABORATORY

The late John Fritz, of Bethlehem, known as the father of the steel industry in the United States, and a member of the Board of Trustees dating from the founding of the University, gave to the University the funds for the erection and thorough equipment of an engineering laboratory. The building was designed and erected in 1910 under the personal supervision of Mr. Fritz. The building is equipped with a general testing section for testing iron and steel, a cement and concrete section, and a hydraulic section. The equipment is used by the Civil Engineering Department in connection with courses in Strength of Materials, Hydraulics, and Cement. Any student in the University who has the proper preparation may receive instruction in this laboratory.

The building is of modern steel frame construction, 94 feet wide and 115 feet long, with the main central section 65 feet in height, and two side sections of lessor height. The external walls which enclose the steel frame are of cement brick lined on the inside with red brick. A traveling crane, of 10-ton capacity, operated by electricity, commands the entire central portion of the building in which the testing of large specimens is carried on.

The general testing section is equipped with an 800,000-pound Riehlé vertical screw testing machine, capable of testing columns 25 feet long or less, tensile specimens 20 feet long or less, and transverse specimens up to lengths of 30 feet; an Olsen universal testing machine of 300,000 pounds capacity; smaller machines for ordinary tension, compression, transverse and torsion tests; a cold-bend testing machine, and a small machine shop. The hydraulic section occupies the east end of the main room and is equipped with various tanks, weirs, pumps and other apparatus for studying problems in hydraulics. The cement and concrete section has a large room for the making and testing of specimens and a room for the storage of materials.

THE ECKLEY B. COXE MINING LABORATORY

The Eckley B. Coxe Mining Laboratory is a building of dressed sandstone, 100 feet long by 75 feet deep, one story high in front with a raised floor in the rear.

The main part of the building contains the Ore Dressing Laboratory, 40 feet by 70 feet; the west wing contains a chemical laboratory, an assay room, a balance room, and a sampling laboratory; the east wing contains the office, recitation room and an instrument room. There is a locker and wash room in the basement of the east wing.

The equipment for the main laboratory, most of which was made by the Allis-Chalmers Co., consists of a gyratory crusher, rolls, screens, jigs, Huntington mill, classifiers, concentrators (tables and vanner), gravity stamps, amalgamating plates, grinding pan, with the necessary apparatus, including grizzly, elevators, feeders, sand-pumps, settling tanks, dryers, and electric motors. The sampling laboratory contains a small jaw crusher, a small gyratory crusher, rolls, sample grinder, and a magnetic separator.

The machinery is driven by seven separate motors, and any one part or all of it can be operated at will, permitting experimental studies and tests of individual machines or groups of machines, or of an entire process, as occasion may require. The entire plant is thus flexible and enables combinations of processes in order to determine the best method to pursue in the treatment of ores, by coarse and fine concentration, and also in the preparation of coals.

Owing to the prominence which flotation methods have assumed in ore concentration, a special department of the main laboratory has been equipped for this work, and several types of testing machines have been installed, together with the necessary equipment of motors, air compressors, etc., for their operation.

The laboratory houses also the following equipment: large and small size Ingersoll-Rand rock drills, Stoper and Jackhammer drills, an Ingersoll-Rand pick machine for coal mining, a Water-Leyner rock drill, a Sullivan hand-power diamond drill machine, and a Temple-Ingersoll electric-air drill.

The laboratory has been named by the Trustees of the University "The Eckley B. Coxe Mining Laboratory" in memory of Eckley B. Coxe, who was universally recognized as a pioneer and a leader in the profession of mining engineering in this country, an active friend and valued Trustee of the University from its early days until his death. The Engineering and Mining Laboratories of Lehigh University, bearing the names of John Fritz and Eckley B. Coxe, record the friendship and close association of these two great engineers in their life-time, and their active interest in Lehigh.

CHRISTMAS HALL

Christmas Hall has historic interest as the first building of Lehigh University. It was originally a church, which was purchased from the Moravian Congregation. In the earliest years of the University it contained a chapel, lecture rooms and students' dormitory. After Packer Hall was completed in 1868, Christmas Hall and Saucon Hall were utilized as students' dormitories and mess hall up to 1885. For many years thereafter Christmas Hall was used by the Departments of Latin, Greek and Modern Languages.

The building is now largely devoted to the Department of Military Science and Tactics.

The office and recitation room of the Department of Greek are on the second floor.

SAUCON HALL

Extensive alterations to Saucon Hall were made in 1896, adapting it to the needs of the Department of English. It contains a study and a recitation room for each instructor, a lecture hall seating 200 persons, and a large room on the ground floor which has been fitted up for the use of the literary societies, with committee rooms adjoining.

COPPÉE HALL

Coppée Hall, formerly the Gymnasium, was completely renovated in 1913 to adapt it to the needs of the College of Arts and Science. On the first floor is a large lecture room, the office and recitation rooms of the Department of Economics and accounting rooms for instruction in Business Administration. On the second floor are the offices and recitation rooms of the Departments of Latin, German, Romance Languages, Philosophy and Education. The Psychological Laboratory, also situated on the second floor, is equipped for elementary instruction and experimentation in the psychology of sense and movement. On the third floor are the seminar room of the College of Arts and Science, also a large room for the use of Accounting and a Statistical Laboratory.

SAYRE OBSERVATORY

By the liberality of the late Robert H. Sayre, one of the Trustees of the University, an Astronomical Observatory was erected on the University grounds, and placed under the charge of the Professor of Mathematics and Astronomy.

The Observatory contains an equatorial telescope by Alvin Clark, of six inches clear aperture and of eight feet focus; a zenith telescope, by Blunt; a superior astronomical clock, by William Bond & Son; a meridian circle; a prismatic sextant, by Pistor and Martins; an engineer's transit and a sextant, by Buff and Buff. Students in practical astronomy receive instruction in the use of the instruments and in observation.

The land upon which the Observatory stands, consisting of seven acres adjoining the original grant, was presented to the University by the late Charles Brodhead, of Bethlehem.

Sayre Observatory Annex

Sayre Observatory Annex contains a modern zenith telescope of four and one-half inches clear aperture, equipped with electric illumination. The building and instruments were presented to the University by the late Robert H. Sayre in 1903. Observations secured with this instrument are for the purpose of investigating the Variations of Latitude.

THE PACKER MEMORIAL CHURCH

The Packer Memorial Church, in which daily chapel exercises are held, was the munificent gift of the late Mrs. Mary Packer Cummings, daughter of the founder of the University. It was built in 1887 and is one of the largest churches in the State. During 1909-10 it was thoroughly renovated; the walls were newly frescoed, new stained glass windows put in place, and electric lights installed. These improvements were made possible by the continued generosity of the donor, Mrs. Cummings.

THE UNIVERSITY LIBRARY

The Library building was erected by the founder of the University in 1877, at a cost of $100,000, as a memorial to his daughter, Mrs. Lucy Packer Linderman.

The building is semi-circular with a façade in the Venetian style of architecture. It is constructed of Potsdam sandstone with granite ornamentation. In the interior there is a reading room 40 by 50 feet from which radiate book cases extending from floor to ceiling; two galleries afford access to the upper cases. Shelf room is provided for one hundred and sixty thousand volumes. One hundred and fifty thousand volumes are now upon the shelves. The list of periodicals numbers about four hundred. The Library is open from 8 A.M. to 9 P.M., except on Sundays and holidays.

The free use of the Library, with the privilege of taking out books, is offered to students of every department on presentation of their registration cards. The use of the books and of the periodicals within the building is free to all persons. Resident graduates of the University have the full use of the Library on payment of three dollars annually. Persons pursuing systematic investigation in any study may be allowed the free use of the Library for a period not exceeding three months without fee. At the discretion of the Director, a deposit may be required when books are issued.

The Eckley B. Coxe Memorial Library

In memory of Eckley B. Coxe, who was for many years a Trustee of the University and who was profoundly interested in its welfare, Mrs. Coxe presented to the University his technical library, consisting of 7727 volumes, together with 3429 pamphlets. As the working library of a man who was remarkable as well for the breadth of his culture as for the extent and thoroughness of his acquaintance with the whole field of applied science, this addition to the resources of the University possesses the greatest value for all professional students.

TAYLOR HALL

Taylor Hall, the gift of Mr. Andrew Carnegie, is a commodious concrete dormitory situated in the University Park, south of Packer Hall. It accommodates 137 students. There are suites of three rooms, (a study and two adjacent bed rooms,) for two occupants, and a few single rooms. The building was named Taylor Hall by Mr. Carnegie in honor of Mr. Charles L. Taylor, his former partner in business, a graduate of the University in the Class of 1876 and a Trustee of the University. The rates for the suites of rooms are $100 a year for each occupant. The single rooms are $80 a year.

PRICE HALL

Price Hall furnishes dormitory accommodation for thirty-four students. It is named in honor of Dr. Henry R. Price, an alumnus of the University of the Class of 1870, President of the Board of Trustees.

Application for rooms in the dormitories should be filed with the Bursar.

DROWN MEMORIAL HALL

Drown Memorial Hall is a memorial to the late Thomas Messinger Drown, LL.D., president of the University from 1895 to 1904. The building was erected by his friends and the alumni of the University and is devoted to the social interests of the University students. It contains study, reading, conversation, and chess rooms, an assembly hall, and the offices of the Alumni Association, the Young Men's Christian Association, the college publications, the dramatic and musical organizations. It also accommodates the Supply Bureau, conducted by the University, the purpose of which is to furnish books, stationery and supplies to the students at reasonable prices. The profits of the Supply Bureau are applied to the upkeep of Drown Memorial Hall.

The office of the Bursar is in Drown Memorial Hall.

THE COLLEGE COMMONS

The Commons was erected in 1907 to furnish a place where students might obtain wholesome food at cost. There are accommodations for 400 students. The present rates for table board are $25 for thirty consecutive days.

TAYLOR GYMNASIUM AND FIELD HOUSE

In 1913 Mr. Charles L. Taylor, a graduate of the University of the Class of 1876 and a member of the Board of Trustees, donated to the University the funds required for the erection of a gymnasium and a field house.

Taylor Gymnasium is situated at the extreme east end of the grounds of the University, adjoining the athletic field. The building is 222 feet long by 73 feet wide. On the ground floor at the north end is located the game room, 93 by 70 feet, used for basketball and wrestling. The game-room is surrounded by a gallery for spectators. The main gymnasium floor measures 90 by 70 feet. Other rooms in Taylor Gymnasium are the offices and measuring room of the Department of Physical Education, a large trophy room, basketball and handball courts, fencing, boxing and wrestling rooms, and locker rooms with accommodations for the entire student-body.

The gymnasium is equipped with all modern appliances for recreative and corrective exercises, also with apparatus for calisthenic and other gymnastics, both for individual and for class work.

In addition to numerous hot and cold shower baths, adjoining the locker rooms is a swimming pool, 75 by 25 feet, with a depth from 4½ to 9½ feet. The capacity of the swimming pool is 95,000 gallons.

Adjoining the gymnasium and the stadium is the Taylor field house. It is two stories in height, and has dressing rooms, lockers and shower baths for visiting and Lehigh teams, and also rooms for medical attention to athletes.

TAYLOR FIELD

An athletic field of more than nine acres in area is provided by the University for the accommodation of students who participate in the various outdoor sports. The Stadium is located on the north side, or lower level, and provides football and baseball fields. It is surrounded by concrete stands having a seating capacity for more than 12,000 spectators. On the upper level there are practice fields for football, baseball, lacrosse and soccer, also a quarter mile track and a 220-yards straightaway, furnishing ample room for exercise by the entire student-body. During the winter months a wooden outdoor running track, fourteen laps to the mile, is provided.

A cage with 60 by 120 feet floor space affords facilities for rifle practice, indoor baseball, lacrosse, and track and field sports practice.

All athletic sports are under the direction and oversight of the Professor of Physical Education, who is aided by an

Athletic Committee composed of alumni and students, members of the Faculty, a member of the Board of Trustees, and the President of the University.

SAYRE PARK

A development of the mountain side of the University grounds was effected through the donation to the University in 1909 of the sum of $100,000 by the children of the late Robert H. Sayre to be applied and used in the development of Sayre Park as a memorial to their father. Mr. Sayre was a Trustee of the University from its foundation in 1866 to his death in 1907. He acted for years as President of the Board of Trustees, and as Chairman of the Executive Committee of the Board, and his services to Lehigh were constant and great.

THE ARBORETUM

The Arboretum is a tract of about eleven acres added in 1909 to the upper end of Sayre Park. It was established by a lover of Forestry and a friend of the University as a tree nursery for the purpose of furnishing illustrative specimens of American trees, and of cultivating trees and shrubs for the beautifying of the Park. All of the more important species of North American trees are to be found in the University Park and the Arboretum. Adjoining the Arboretum a tract of seven acres has been planted with a variety of indigenous trees as an exhibition growth of tree culture.

THE UNIVERSITY MUSEUMS

The University Museums include large collections illustrating various branches of Chemistry, Metallurgy, Geology, Mineralogy, Zoölogy, and Archæology.

The Metallurgical Cabinet contains specimens illustrating the various processes for obtaining the more common metals.

The Zoölogical collections include the Packer collection of recent shells and the Werner collection of American birds. The latter contains over three hundred and fifty species. In most cases, in addition to the adults, specimens in different plumages as well as the nests and eggs are represented.

The Geological and Mineralogical Museums are housed in the west end of Williams Hall, and contain the Roepper and Keim mineral collections, collections of fossils, specimens of ore from mining districts, and extensive series of rocks which illustrate the type occurrences in different parts of the world.

The Cummings Archæological Cabinet has three thousand specimens and includes Dr. Stubb's collection of Indian relics, weapons and utensils.

UNIVERSITY LECTURES

From time to time during the University year, distinguished men in science, letters, art and business give lectures before the student-body.

HONORARY SCHOLARSHIP SOCIETIES

PHI BETA KAPPA. Students in the College of Arts and Science and the College of Business Administration who up to the middle of the Senior year maintain high scholarship may be elected to membership, also a limited number of technical students whose work in philosophical, scientific, and language studies is of high grade.

TAU BETA PI. Students in the College of Engineering who up to the middle of the Junior year maintain high scholarship may be elected to membership.

SOCIETIES OF THE COLLEGE OF ENGINEERING

An adjunct of value in promoting professional spirit in the College of Engineering is furnished by the departmental societies,—volunteer organizations of students who meet monthly to present papers, to discuss engineering topics and, from time to time, to hear addresses by invited engineers and scientists of note.

The first of these organizations historically was the Chemical Society, organized in 1871. The original Engineering Society, open to all technical students of the University, was started in 1872. From 1885 to 1889 it issued quarterly numbers of *The Journal of the Engineering Society of Lehigh University*, containing contributions by members, alumni and others. Many of the papers read before this Society from 1890 to 1893 were published in the *Lehigh Quarterly* of those years.

Independent societies were formed in 1900 by students in the Departments of Civil Engineering and Mechanical Engineering. The Electrical Engineering Society, founded in 1887, was reorganized in 1901. The Mining and Geological Society began in 1904, the Metallurgical Society in 1917, and the Railroad and the Naval Engineering Society in 1920.

THE ARTS AND SCIENCE CLUB

The Arts and Science Club is the student society of the College of Arts and Science. It was founded in 1905, with the aim of promoting literary and cultural interests in the University. Students in all courses are eligible for membership. The programs of meetings include papers by members, discussions led by teachers in the College, and occasional talks by scholars from other institutions.

THE Y. M. C. A. OF THE UNIVERSITY

The Christian Association is a voluntary organization of the students for the promotion of the religious, moral, and social life of the University. It was organized April 18, 1890, and on October 11, 1890, united itself with the intercollegiate Young Men's Christian Association. The movement is distinctly for and by students, all the officers, with the exception of the General Secretary, being chosen from the student-body. The General Secretary is Mr. Sterling G. Harris, whose office is in Drown Memorial Hall.

PUBLIC WORSHIP

Morning prayers are held in Packer Memorial Church at 7:45 a.m. on every week day except Saturday. Attendance of students is required.

FOUNDER'S DAY

On the first or second Saturday of October of each year, commemorative exercises are held in honor of the founder of the University. On Saturday, October 14, 1922, the forty-third Founder's Day was celebrated. In connection with these exercises Charles Russ Richards, Eng.D., LL.D., was installed as President of the University.

UNIVERSITY SUNDAY

The University sermon is preached on the Sunday before University Day. The Rt. Rev. Philip Cook, D.D., Bishop of Delaware, was the preacher on Sunday, June 11, 1922, in the Packer Memorial Church.

HONOR SYSTEM

The Honor system is in force at Lehigh University, having been adopted by the unanimous action of the student-body.

GRADUATING THESES

Theses, when reqired, are accompanied by drawings and diagrams, whenever the subjects need such illustration. The originals are kept by the University, as a part of the students' record, for future reference, but copies may be retained by students, and may be published, permission being first obtained from the Faculty.

UNIVERSITY DAY

University Day is the close of the collegiate year. On this day graduation exercises are held at which an address is given by a representative of the Alumni Association, prizes and honors are awarded, and degrees are conferred.

The program of the exercises on June 13, 1922, was as follows:

MUSIC

PRAYER

ALUMNI ADDRESS

FLOYD WILLIAM PARSONS, E.M., '02

ANNOUNCEMENT OF PRIZES AND HONORS

The Wilbur Scholarship of $200,
CHARLES FRANCIS HILLER, of Buchanan, Mich.
First in rank in the Sophomore Class.

The Alumni Prizes of $25, for the first honor men in the Junior Class in various departments,

Electrical Engineering,
CLEMENT SOLOMON SCHIFREEN, of Catasauqua, Pa.

Chemistry and Chemical Engineering,
CHARLES HECK MILLER, of Ancora, N. J.

The Wilbur Prizes of $10 for excellence in the studies of the Sophomore year,

In Mathematics,
ROBERT WILLIAM ENNIS, of Mount Penn, Pa.

In Physics,
JOHN C. KITCHIN, JR., of Columbia, N. J.

The Wilbur Prizes of $15 and $10, for excellence in the studies of the Freshman year,

In Mathematics,
First: Ralph Arthur Lambert, of Bethlehem, Pa.
Second: Harvey H. Schock, of Shartlesville, Pa.
In English,
Arthur Stanley King, of Toms River, N. J., and
Clarence Henry Porter, of Washington, D.C., jointly.
In German,
Harry Knight Kerr, of Philadelphia, Pa.
In French,
Paul James Finegan, of Burlington, N. J.

The William H. Chandler Chemistry Prizes, of $25 each,
Freshman Year: James Bliss Austin, of Chicago Ill.
Sophomore Year: John C. Kitchen, jr., of Columbia, N.J.
Junior Year: Charles Heck Miller, of Ancora, N. J.
Senior Year: Cyril Finton Goldcamp, of Ironton, O.

Prize of $25 for best Thesis in Department of Electrical Engineering,
Harry Harrison Marsh, jr., of Wheeling, W. Va.

SENIOR HONORS

College of Arts and Science,
First: Michael Fresoli, of Bethlehem, Pa.
College of Business Administration,
First: Charles Josiah Dunkle, of Harrisburg, Pa.
Second: Leslie Lungren Drew, of Asbury Park, N. J.
College of Engineering,
Civil Engineering Course,
First: Edwin Lewis Reynolds, of Bethesda, Md.
Mechanical Engineering Course,
First: Ernest Paul Gangewere, of Chattanooga, Tenn.
Second: Alexander Korbel, of Bethlehem, Pa.
Metallurgy and Mining Engineering Courses,
First: William Henry Tavenner, of Washington, D. C.
Electrical Engineering Course,
First: John Winebrenner Horine, jr., of Columbia, S. C.
Second: Elmer Francis DeTurk, of Reading, Pa.
Chemistry and Chemical Engineering Courses,
First: Cyril Finton Goldcamp, of Ironton, O.
Second: George Frederick Adelbert Stutz, jr., of Washington, D. C.

JUNIOR HONORS

College of Arts and Science,
First: John Werner Kreisel, of Pen Argyl, Pa.
Second: John Kenneth Barrall, of Allentown, Pa.

College of Engineering,
Civil Engineering Course,
First, John Harold Van Ness, of Paterson, N. J.
Second: Charles Raymond Wire, of Washington, D. C.
Mechanical Engineering Course,
First: Edwin Alden Ferris, of Ridgewood Park, N. J.
Metallurgy and Mining Engineering Courses,
First: Robert Gair Pfahler, of Wilkes-Barre, Pa.
Second: Charles Owen Burgess, of Niagara Falls, N. Y.
Electrical Engineering Course,
First: Clement Solomon Schifreen, of Catasauqua, Pa.
Second: Edwin Henry Snyder, jr., of Washington, D. C.
Chemistry and Chemical Engineering Courses,
First: Charles Heck Miller, of Ancora, N. J.

SOPHOMORE HONORS

In Mathematics,
First: Robert William Ennis, of Mount Penn, Pa.
Second: John C. Kitchen, jr., of Columbia, N. J.

In Physics,
First: John C. Kitchen, jr., of Columbia, N. J.
Second: Robert William Ennis, of Mount Penn, Pa.

FRESHMAN HONORS

In Mathematics,
First: Ralph Arthur Lambert, of Bethlehem, Pa.
Second: Harvey H. Schock, of Shartlesville, Pa.

In English,
Arthur Stanley King, of Toms River, N. J., and
Clarence Henry Porter, of Washington, D.C., jointly.

In German,
Harry Knight Kerr, of Philadelphia, Pa.

In French,
Paul James Finegan, of Burlington, N. J.

Degrees were then conferred as follows:

DEGREES IN COURSE

MASTER OF ARTS

Herbert Franklin Arnold, A.B., (*Franklin and Marshall College*)	Easton, Pa.
Carl Henry Karch, A.B. (*University of Pennsylvania*)	Allentown, Pa.
Henry Rath McCullough, A.B., (*Muhlenberg College*)	Allentown, Pa.
Warren Allen Ziegenfuss, A.B., (*Muhlenberg College*)	Allentown, Pa.

MASTER OF SCIENCE

August Concilio, E.E., (*Lehigh University*)	Bethlehem, Pa.
Mahlon L. Frankenfield, B.S., (*Muhlenberg College*)	Allentown, Pa.
George Joseph Roche, E.E., (*Lehigh University*)	Baltimore, Md.

BACHELOR OF ARTS

Ambrose Edward Dvorschak,	Drifton, Pa.
Michael Fresoli,	Bethlehem, Pa.
Charles Pennypacker Gooding,	Wilmington, Del.
Herman Ludwig Weber,	Allentown, Pa.
Harvey Alfred Zinszer	Bethlehem, Pa.

BACHELOR OF SCIENCE

Charles Josiah Dunkle,	Harrisburg, Pa.
Leslie Lungren Drew,	Asbury Park, N. J.
Carl Harry McKenzie,	Dallas, Tex.
Paul Knauss Whytock,	Bethlehem, Pa.

CIVIL ENGINEER

William Michael Donovan,	Philadelphia, Pa.
Edmond Joseph Downing,	Scranton, Pa.
James Royce Farrington,	Annandale, N. J.
James Robert Job,	Nanticoke, Pa.
Harold William Morgan,	Altoona, Pa.
Edwin Louis Reynolds,	Bethesda, Md.
George Robert Swinton,	Atlantic City, N. J.
Harold Dolson Wallace,	East Orange, N. J.
William Hurr Waltz,	Williamsport, Pa.
Edmund Joseph Whims,	Saint Clair, Pa.
Abram Reber Wingate, jr.,	Washington, D. C.

MECHANICAL ENGINEER

Roy Dawson Allen,	Belvidere, N. J.
William Henry Boland,	Westboro, Mass.
William Lloyd Bowler,	Glenside, Pa.
Henry Tregellas Bowman,	Schuylkill Haven, Pa.
Henry Carroll,	Bethlehem, Pa.
Lee Heicher Coleman,	Steelton, Pa.
Roy Lester Culler,	Mechanicsburg, Pa.
Ernest Paul Gangewere,	Chattanooga, Tenn.
Jacob Aaron Gerlach,	Easton, Pa.
Eduardo Gonzales,	Torreon, Coah., Mexico.
Charles Huntington Greenall,	Allentown, Pa.
Herbert Julius Kleine,	Philadelphia, Pa.
Alexander Korbel,	Bethlehem, Pa.
James Floyd Marshall,	Wilkes-Barre, Pa.
George Nass, 3rd,	Overbrook, Pa.
Paul Clader Reichard,	Allentown, Pa.
Samuel Procter Rodgers,	Baltimore, Md.
Auguste Louis Saltzman,	East Orange, N. J.
Carl Louis Schneider,	Elizabeth, N. J.
Earl Stimson, jr.,	Baltimore, Md.
Charles Carter Strauch,	Pottsville, Pa.
Peyton Leftwich Terry,	Roanoke, Va.
Lawrence Northrup Van Nort,	Scranton, Pa.

METALLURGICAL ENGINEER

Ray Long Eisenhard,	Allentown, Pa.
George Newlin Ewing,	Philadelphia, Pa.
Omar Vivien Greene,	Yonkers, N. Y.
Raymond Anthony Keenan,	New Kensington, Pa.
Arthur Rhea Little,	Petersburg, Pa.
Paul Fisher Mumma,	Waynesboro, Pa.
Clarence Prior Salmon,	Rochester, N. Y.
Leslie Clifton Whitney,	Marlboro, Mass.
Robert Thomas Wood,	Palmerton, Pa.

ENGINEER OF MINES

Herman Charles Beeckel,	Philadelphia, Pa.
Tsung-Fu Chen,	Changsha, China
James Coalter Crawford, jr.,	Mount Vernon, N. Y.
Daniel Benjamin Dimmig,	East Greenville, Pa.
Shou-Chuan Huang,	Kaiping, Chihli, China.
Albert McIlvaine Michell,	Marion, Ky.
Roy Francis Miller,	Altoona, Pa.
Adolph Theodore Prigohzy,	Brooklyn, N. Y.
William Henry Tavenner,	Washington, D. C.
Stuart Worley Williamson,	Womelsdorf, Pa.
John Edgar Miller Wilson,	Bethlehem, Pa.

ELECTRICAL ENGINEER

John Duffield Alrich,	Bethlehem, Pa.
Granville Martin Brumbaugh,	Washington, D. C.
Charles Taylor Deats,	Flemington, N. J.
Elmer Francis DeTurk,	Reading, Pa.
Robert C. Hicks, jr.,	Philadelphia, Pa.
John Winebrenner Horine, jr.,	Columbia, S. C.
Clinton H. Ide,	Harvey's Lake, Pa.
Claude Luther Knoderer,	Steelton, Pa.
Warren Hornberger Lutz,	Denver, Pa.
Harry Harrison Marsh, jr., A.B., (*Marietta College*)	Wheeling, W. Va.
John Walter Moorehouse,	Monaca, Pa.
Warren Cyrus Spatz,	Reading, Pa.
Watson Fergus Tait, jr., A.B., (*Marietta College*)	Parkersburg, W. Va.

CHEMICAL ENGINEER

John Lorah Bertolet,	Reading, Pa.
Paul Emil Bowman,	Schuylkill Haven, Pa.
Howard Stolpp Bunn, B.A., (*Lehigh University*)	Elkins Park, Pa.
Donald Moyer Bush,	Bethlehem, Pa.
James Stark Carey,	Harrisburg, Pa.
Frederick Mertz Christman,	Reading, Pa.
Richard James Clark,	Bethlehem, Pa.
Samuel Cottrell, jr.,	Washington, D. C.
William Eugene Gerber,	York, Pa.
Cyril Finton Goldcamp,	Ironton, O.
Abraham Albert Gross,	Harrisburg, Pa.
Walter Fitz James Hindry,	Saint Augustine, Fla.
Francis Christian Huber,	New York, N .Y.
Rupert DeArmond Hughes,	Montclair, N. J.
Frank Aaron Jacobs,	Bethlehem, Pa.
Noah Abraham Kahn,	Bethlehem, Pa.
Joseph Albert Kivert,	Northampton, Pa.
Robert Lee Lerch,	Tacoma Park, D. C.
Edward William McGovern, jr.,	Hammonton, N. J.
Chien-Chung Ma,	Amoy, China.
Harold Wagner Major,	Lehman, Pa.
Richard Henry Morris, 3rd,	Philadelphia, Pa.
Ralph Harrison Potts,	Reading, Pa.
Carlton Hecker Schlesman,	Allentown, Pa.
Walter Louis Shearer,	Washington, D. C.
Charles Forbes Silsby,	Washington, D. C.
Charles Frederick Adelbert Stutz, jr.,	Washington, D. C.
Theodore MacLean Switz,	East Orange, N. J.
Harold James Vogt,	Brooklyn, N. Y.
Charles Russell Wolfe,	Asbury Park, N. J.

NAVAL ENGINEER

Fred Elliott Bailey,	Cazenovia, N. Y.
Joseph Light Boltz,	Lebanon, Pa.
Everett Morgan Enslin,	Wilkes-Barre, Pa.
David Green,	Atlantic City, N. J.
Alfred Cope Hartshorne,	Phoenixville, Pa.
Moncrief Ostrander Jefferson,	Riverhead, N. Y.
Paul Edward Miller,	Bellwood, Pa.
Robert Rodney Rhoad,	Philadelphia, Pa.
Abraham Schropp Thaeler,	Nazareth, Pa.
Austin Bartlett Warren,	Westfield, Mass.
Harold Martin Woelfel,	Freeland, Pa.

HONORARY DEGREES

MASTER OF SCIENCE

Paul Bernard de Schweinitz, M.E.,	Bethlehem, Pa.

DOCTOR OF LAWS

Henry Sturgis Drinker, E.M., LL.D.,	Merion Station, Pa.

SCHOLARSHIPS, FELLOWSHIPS, AND PRIZES

THE WILBUR SCHOLARSHIP

The Wilbur Scholarship was founded in 1872 by the late E. P. Wilbur and is the sum of $200 awarded annually to the student in the Sophomore Class having the best record.

THE HARRY S. HAINES MEMORIAL SCHOLARSHIP

Mrs. Henry S. Haines, of Savannah, Ga., established in 1889 a scholarship of the annual value of $200 as a memorial to her son, Henry Stevens Haines, M.E., a member of the Class of 1887. This scholarship is devoted to the support at Lehigh University, throughout his scholastic career, of one student in the Course of Mechanical Engineering.

THE FRED. MERCUR MEMORIAL FUND SCHOLARSHIPS

Friends of the late Frederick Mercur, of Wilkes-Barre, Pa., General Manager of the Lehigh Valley Coal Company, desiring to establish a memorial of their friendship and esteem, and to perpetuate his memory, contributed and placed in the hands of the Trustees a fund called "The Fred. Mercur Memorial Fund." The income from this Fund, amounting to $600, is annually awarded to students of the University.

THE JOSEPH MANN PRICKITT SCHOLARSHIP

Mr. and Mrs. Cooper H. Prickitt, of Burlington, N. J., established, in April, 1919, a scholarship, to be known as the

Joseph Mann Prickitt Scholarship, in memory of their son, Joseph Mann Prickitt, of the Class of 1917, who died on March 10, 1916.

This scholarship is of sufficient amount to cover expenses for tuition, fees and books. It is the expressed wish of the donors that the scholarship be awarded to graduates of the Burlington, N. J., High School on the nomination of the Principal of that school, subject to the approval of the President of the University, or in case of no nomination from that school that the award be made to deserving students from other places.

THE ECKLEY B. COXE MEMORIAL FUND

In memory of the late Eckley B. Coxe, Trustee of the University, Mrs. Coxe has established a fund, amounting to $64,350, the interest of which is used, under the direction of the Trustees of the University, and subject to such regulatons as they may adopt, for the assistance of worthy students requiring financial aid.

THE FRANK WILLIAMS FUND

Frank Williams, E.M., of Johnstown, Pa., a graduate of the course in Mining and Metallurgy of the Class of 1887, who died October, 1900, bequeathed to the University the greater part of his estate, now amounting to over $140,000, to found a fund, the income of which is lent to deserving students. At present the larger part of this income is devoted to certain life tenants under Mr. Williams' will. After their death the entire income will be available for loans.

THE CALLENDER-CARNELL FELLOWSHIP

The Callender-Carnell Fellowship for the promotion of research in chemistry, established in 1919, is a gift of $1500 annually by an anonymous friend of the late George D. Callender, a chemist, who died in Chicago in 1914 while associated with the donor of the scholarship, and of the late William C. Carnell. Mr. Callender was a native of Linlithgow, Scotland, and was graduated from the chemistry department of Glasgow University. Mr. Carnell was a graduate of the Course in Chemistry of Lehigh University, of the Class of 1894.

WILBUR PRIZES

A fund was established by the late E. P. Wilbur for distribution in prizes as the Faculty shall determine. This fund yields an annual income of $100.

THE PRICE PRIZE FOR ENGLISH COMPOSITION

Dr. Henry R. Price, an alumnus and Trustee of the University, established in 1898 an annual prize of the value of $25, to be awarded in June to that member of the Freshman Class who shall write the best essay on a topic in English Literature assigned by the head of the Department of English not later than the beginning of the second term in each year. Special stress will be laid upon clearness of thought and force of expression. Students must signify in writing their intention of competing not later than the first of April.

The subject for the prize essay in June, 1923, will be: "Irving's Works, the Spanish Group."

THE JOHN B. CARSON PRIZE

An annual prize of $50 was established in 1909 by Mrs. Helen C. Turner, of Philadelphia, Pa., in memory of her father, John B. Carson, whose son, James D. Carson, was a graduate of the Civil Engineering Department of Lehigh University in 1876. It is awarded for the best thesis in the Civil Engineering Department.

WILLIAM H. CHANDLER PRIZES IN CHEMISTRY

Four annual prizes in chemistry of $25 each were established in 1920 by the gift of Mrs. Mary E. Chandler, of Bethlehem, Pa., widow of Dr. William H. Chandler, who was Professor of Chemistry in Lehigh University from 1871 until his death in 1906. In memory of Dr. Chandler the Faculty named the prizes "The William H. Chandler Prizes in Chemistry." Awards are made at the commencement exercises in June to the four members of the Freshman, Sophomore, Junior and Senior classes deemed by the Faculty worthy to receive them.

THE ELECTRICAL ENGINEERING PRIZE

An annual prize of $25, established by an anonymous graduate of the Electrical Engineering course, is awarded to the member of the graduating class presenting the best thesis in Electrical Engineering.

THE ALUMNI ASSOCIATION

The Alumni Association, which has been in existeenc since 1876, was incorporated in 1917 under the name The Alumni Association of the Lehigh University, Inc. The Alumni Secretary, who devotes all of his time to Association affairs, is Walter R. Okeson, '96, whose offices are in Drown Memorial Hall. Mr. Okeson edits the *Lehigh Alumni Bulletin*, a news publication published monthly from October to June, inclusive, and the *Alumni and Student List*. An appointment bureau is maintained by the Association.

The officers of the Alumni Association for 1922-23 are:

President, Henry D. Wilson, '01, of Pittsburgh, Pa.
Vice-President, Clarence W. Hudson, '89, of New York, N. Y.
Vice-President, William A. Webb, '91, of Philadelphia, Pa.
Treasurer, Alan C. Dodson, '00, of Bethlehem, Pa.
Executive Secretary, Walter R. Okeson, '96, of Bethlehem, Pa.
Archivist, Preston A. Lambert, '83, of Bethlehem, Pa.

Honorary Alumni Trustees: Homer D. Williams, '87, of Pittsburgh, Pa.; William C. Dickerman, '96, of New York, N. Y.; Taylor Allderdice, '83, of Pittsburgh, Pa.; and Aubrey Weymouth, '94, of New York, N. Y.

The following are the local alumni clubs: New York Lehigh Club, Philadelphia Lehigh Club, Pittsburgh Lehigh Club, Chicago Lehigh Club, Washington Lehigh Club, Detroit Lehigh Club, Northeastern Pennsylvania Lehigh Club (Scranton and Wilkes-Barre, Pa.), Maryland Lehigh Club (Baltimore, Md.), Lehigh Club of New England (Boston, Mass.), Intermountain Lehigh Club (Salt Lake City, Utah), Lehigh Club of Central Pennsylvania (Harrisburg, Pa.), Lehigh Club of Northern New York (Schenectady, N. Y.), Lehigh Club of Northern Ohio (Cleveland, O.), Lehigh Club of Southern New England (Hartford, Conn.), Lehigh Club of Western New York (Buffalo, N. Y.), Southern Anthracite Lehigh Club (Pottsville, Pa.), Southwestern Lehigh Club (St. Louis, Mo.), Lehigh Home Club (Bethlehem, Pa.), Lehigh Club of China (Wuchang, China), Lehigh Club of Cuba (Havana ,Cuba).

ALUMNI PRIZES

By a resolution of the Alumni Association of September 21, 1900, the Alumni Scholarship Fund, which was originally designed to help poor students, was with the consent of the contributors diverted from this purpose and the income devoted to prizes to members of the Junior Class. In June, 1923, two prizes of $25 each will be awarded to the first honor men of the courses in Civil and Mechanical Engineering. In subsequent years the prizes will be awarded to the first honor men of the technical courses in turn.

ALUMNI FRIZES FOR ORATORY

The Alumni Association of Lehigh University established in 1882 annual prizes for excellence in oratory, amounting to $50.

REGULATIONS

1. The contest shall be held on the 22nd day of February, or on the day designated by the University to commemorate the birthday of Washington.

2. There shall be a first prize of $25, a second prize of $15, and a third prize of $10.

3. To entitle one to be a competitor he must be a member of the Junior Class, taking a regular course.

4. Subjects for the orations shall be announced at the beginning of the first term of every year, and upon one of these each competitor shall write an oration not to exceed 1200 words, taking about eight minutes in delivery.

5. Each oration shall bear upon its first page a fictitious name or motto, and shall be accompanied by a sealed envelope, which shall be superscribed with the same name or motto, and an address by which it may be reclaimed. The envelope shall contain the real name and address of the writer, with the declaration that the oration is his own original work. The examiner, having adopted a standard of excellence, may reject any or all of the orations presented which do not attain to this standard; of such as do—should they be sufficient in number—the best six shall be chosen and their envelopes opened. The others shall be returned to the addresses given with their envelopes unopened.

6. The Executive Committee of the Alumni Association, or a committee of not fewer than three to be appointed by them, shall hear the competitors whose orations shall have been approved, and the awards shall be made by a majority of these judges.

7. In awarding the prizes the judges shall consider both the literary merits and the delivery of each oration.

8. These rules are subject to amendment by the Faculty.

The annual contest in Oratory for the Annual Prizes was held on February 22, 1922, with the following competitors:

Elmer Morton Bloch, of Newport, R. I.
David Getz, of Allentown, Pa.
Frederick William Trumbore, of Bethlehem, Pa.
Edwin Van Keuren, of Bethlehem, Pa.

The first prize was awarded to Mr. Getz, the second to Mr. Trumbore, the third to Mr. Van Keuren.

The judges were Prof. Preston A. Lambert, '83; Howard A. Foering, '90, and the Rev. David B. Clark, '01.

WILLIAMS PRIZES IN ENGLISH

Professor Edward H. Williams ,jr., an alumnus of the University of the Class of 1875, established in February, 1900, prizes amounting annually to $335 for excellence in English Composition and Oratory. The conditions of the endowment are as follows:

Sophomore Composition Prizes

1. At the beginning of each term the Sophomore Class shall be divided into two sections alphabetically and to that student in each section who, at the end of a term, and of each term, shall receive the highest rank in English Composition during that term shall be awarded the "First Sophomore Composition Prize" of ten dollars, and to that student in each section as aforesaid who shall receive the next highest rank in the same subject shall be awarded the "Second Sophomore Composition Prize" of five dollars. In each year there will be offered four first and four second prizes—a total of sixty dollars.

If more than one student shall receive the highest rank in any section, the amount of the two prizes shall be added together and the sum—fifteen dollars—shall be equally divided between them, and no second prize shall be offered in that section. If more than one student shall receive the next highest rank in any section when there is but one contestant for the first prize, the second prize shall be equally divided between the two having the second rank.

Senior Premiums

2. The Faculty shall publish within one month of the end of the University year a list of subjects for dissertaitons, selected from English Literature and Economics, entitled Subjects for Senior Premiums. To this list shall be appended a date near the first of January following—to be determined upon by the Faculty—when the contest shall be declared closed and the dissertations shall become due.

From the above list any member of the Senior Class may select a subject and write thereon a dissertation, whose length shall be prescribed by the Faculty, and shall send the same anonymously, but marked for identification, as the Faculty may direct, to the Secretary of the Faculty before the date aforesaid.

The Faculty, or its committee, shall meet on the above date and at subsequent adjourned meetings, and, first, having determined upon a standard of excellence which each and all dissertations must reach in order to be admitted to the following competition, shall examine the dissertations submitted to them and admit those which reach the above standard. In case none are up to the standard, and are admitted they shall declare the contest closed for that year, and no prizes shall be awarded.

If one or more dissertations are admitted as aforesaid, the Faculty, or its committee, shall arrange them in the order of their literary merit and soundness of their reasoning, and the six highest in this arrangement shall be retained and all others returned as directed by the writers, who shall remain unknown. The names of the successful writers shall be ascertained and they shall be required to recast their dissertations in the form of an oration, and to speak the same in public at such time during the Commencement Week as the Faculty shall determine.

The Faculty, or its committee, shall be the judges of excellence in the speaking, and shall award to that Senior student who shall speak his oration in the best manner, the Senior Gold Medal, of the value of one hundred dollars, or, at his option, one hundred dollars in gold. They shall award to the other five speakers the five Senior Premiums of ten dollars each.

Graduate Prize

3. At the end of the University year, during Commencement Week, the Faculty shall publish a second list of subjects for theses selected from English Literature, Economics, Mental and Moral Science, and similar subjects which require thought and application, and which must be of such a character that their mastery shall be accomplished only through considerable research and study.

From this list any member of the class just graduating; the Senior Class of the coming University year; a graduate of one year's standing whether in or out of residence, and a graduate of any class who may be, during the coming year, in actual residence and taking post-graduate work at the University, may select a subject and write thereon a thesis of not less than five thousand words and send the same to the Secretary of the Faculty, anonymously, but marked for identification as the Faculty may designate, before the date, which the Faculty shall select within one month before the next Commencement, and which date must appear on the above list.

The Faculty, or its committee, shall meet on this date, and at adjourned meetings thereafter, and, having first established a standard of excellence, which must, first, be a hgih one, and second, shall require on the part of the competitor ability in the plan, development, argument, and conclusion of the work, as well as literary merit in its composition and presentation, shall admit to the following competition only those who fully attain to the above required standard.

If none of the theses submitted shall have attained to the standard aforesaid, the competition shall be declared closed and the prize shall not be awarded.

To the author of that thesis which shall have been admitted to the competition, and which shall have been declared of the highest excellence, the Graduate Prize of one hundred and twenty-five dollars shall be awarded and presented on Commencment Day with the other prizes and awards of that day.

The successful thesis shall be the property of the University, but the author shall be allowed to retain one copy. Publication of the thesis by the author will only be permitted by vote of the Faculty. Such publication must, however, be entitled Graduate Prize Thesis of the Lehigh University.

The winner of a prize shall not be allowed to compete again.

Professor Williams has directed that the income derived from the endowment for the Williams Prizes shall be applied and used as follows.

1. All portions of said income remaining after the payment of all prizes awarded in any one year, shall be invested and added to the principal of said endowment.
2. If any prize shall, for any reason, be not awarded in any year, the sum thus unpaid shall be invested and added to the said principal.
3. If for any reason the amount of the income from said endowment shall fall below the total sum necessary to pay said prizes, the amounts of the individual prizes shall be proportionally reduced till their sum shall be equal to three-fourths of the said reduced income, and this three-fourths shall be used to pay them; the remaining one-fourth is to be invested and added to the said principal.
4. This investment of residues, as above said, shall continue till the principal of said endowment shall be sufficiently large to furnish an income at two per cent. interest, which will be sufficient to pay all said prizes now established.
5. When said principal shall be large enough to furnish the necessary sum to defray the said prizes, as stated in No. 4, the surplus income remaining after paying all the prizes awarded during the year shall be used by the President of the University to encourage oratory, debate, or any other object decided upon by the Faculty.

THE FRAZIER AND RINGER MEMORIAL FUND

This is a fund for the medical and surgical care of needy students, established in memory of Benjamin West Frazier, A.M., Sc.D., formerly Professor of Mineralogy and Metallurgy, and Severin Ringer, U.J.D., formerly Professor of Modern Languages and Literatures and of History, each of whom faithfully served Lehigh University for one-third of a century. The fund was started February 12, 1906, by the donation of $13,000 by the late Robert H. Sayre. It is the hope and expectation of the friends of the University that this fund may, by other donations, be increased in time to amount to a sum sufficient to insure free medical and surgical attendance to all students of the University requiring such aid.

STUDENTS

B.A.—Bachelor of Arts.
Bus.—Business Administration.
C.E.—Civil Engineering.
Ch.E.—Chemical Engineering.
Chem.—Chemistry.
E.E.—Electrical Engineering.
E.M.—Mining Engineering.
M.E.—Mechanical Engineering.
Met.—Metallurgy.
N.E.—Ship Construction and Marine Transportation.

The names in the following lists include all the students who have registered and attended recitations at the University for the current year.

GRADUATE STUDENTS

	For Degree	Residence
Anderson, Harold Victor, B.Ch.E., (*University of Michigan*)	M.S.,	Bethlehem.
Anderson, Rachel Evans, A.B., (*Wellesley College*)	M.S.,	Easton.
Barzun, Henri Martin, B. es L., (*University of Paris*)	M.A.,	Bethlehem.
Buckley, Malcolm Kee, B.S., (*Lehigh University*)	M.S.,	Allentown.
Burgess, Eugene Willard, B.S., (*Lehigh University*)	M.S.,	Joliet, Ill.
Carroll, Clara, B.A., (*Moravian College for Women*)	M.A.,	Bethlehem.
Carter, Wayne Hanley, B.S., (*Lehigh University*)	M.S.,	Bethlehem.
Coaklay, Maurice Thomas, Ch.E., (*Lehigh University*)	M.S.,	Easton.
Crow, Mary Matilda, B.A., (*Moravian College for Women*)	M.A.,	Bethlehem.
Everhart, William Alfred, A.B., (*Miami University*)	M.S.,	Granville, O.
Ewing, Boyd Ross, jr., B.A., (*Lehigh University*)	M.A.,	Bethlehem.
Farber, Hobart Amory, B.A., (*Lehigh University*)	M.A.,	Northampton.
Fink, William LeRoy, A.B., (*Ursinus College*)	M.A.,	Slatington.
Glentzer, Kenneth V., B.S., (*University of Indiana*)	M.S.,	Bethlehem.

Greider, Emma Cora, A.B., (*Hunter College*)	M.A.,	Portland.
Gruber, Howard Dietrich, E.E., (*Lehigh University*)	M.S.,	Bethlehem.
Harris, Sterling G., B.S., (*Pennsylvania State College*)	M.A.,	Bethlehem.
Hofford, Hilda Naomi, B.A., (*Moravian College for Women*)	M.A.,	Allentown.
Kistler, Paul N., B.S., (*Pennsylvania State College*)	M.S.,	Bethlehem.
Kreidler, William Alfred, B.S., (*Lehigh University*)	M.S.,	Bethlehem.
Kunkel, George A., A.B., (*Muhlenberg College*)	M.A.,	Northampton.
Leach, Lester Lorraine, B.S., (*University of Missouri*)	M.S.,	Bethlehem.
Lyle, George Averett, B.S., (*Hampden-Sidney College*)	M.A.,	Bethlehem.
McKenzie, Carl Harry, B.S., (*Lehigh University*)	M.S.,	Dallas, Texas.
Nordenholt, George Fred, M.E., (*Lehigh University*)	M.S.,	Bethlehem.
Perkins, Wallace Wyman, A.B., (*Harvard University*)	M.A.,	Bethlehem.
Philippides, John Argyrios, B.A., (*Lehigh University*)	M.S.,	Easton.
Quast, Walter Flamm, M.E., (*Lehigh University*)	M.S.,	Bethlehem.
Rau, Henry Brunner, B.S., (*Moravian College*)	M.S.,	Bethlehem.
Riley, John D., B.S., (*University of Pennsylvania*)	M.S.,	Allentown.
Ringleben, August Andrew, A.B., (*Ursinus College*)	M.A.,	Hazleton.
Shedd, Thomas C., S.B., (*Brown University*)	M.S.,	Phoenixville.
Shen, Dzu-Kun,	M.S.,	Hankow, China.
Shimer, Lenore D., B.A., (*Smith College*)	M.A.,	Bethlehem.
Shunk, Helen Marion, A.B., (*Moravian College for Women*)	M.A.,	Bethlehem.
Smith, Norman E., A.B., (*Pennsylvania State College*)	M.A.,	Slatington.

Snyder, J. W., A.B., M.A., (*Bucknell University*)	M.A.,	Slatington.
Stewart, John Lammey, jr., B.S., (*Pennsylvania State College*)	M.S.,	Bethlehem.
Strunk, Elvira M., B.S., (*Albright College*)	M.S.,	Changsha, Hunan, China.
Talmage, Sterling Booth, B.S., (*University of Utah*)	M.S.,	Salt Lake City, Utah.
Wetherhold, Mark Andrew, B.S., (*Muhlenberg College*)	M.S.,	Allentown.
Wetherhold, Ralph Vitilas, B.S., (*Muhlenberg College*)	M.S.,	Allentown.
Yeager, Howard James, A.B., (*Franklin and Marshall College*)	M.A.,	Emaus.
Zell, Harry Allen, A.B., (*Franklin and Marshall College*)	M.A.,	Bethlehem.
Zinszer, Harvey Alfred, B.A., (*Lehigh University*)	M.A.,	Bethlehem.

Hobbs, Douglas Brown, B.A., (*University of the South*)	Met.,	Live Oak, Fla.
Lloyd, Francis James, jr., B.A., (*St. John's College*)	C.E.,	Pocomoke City, Md.
Villaume, Frederick Henry A.B., (*Columbia University*)	E.M.,	New York, N. Y.
Smith, Alexander Forbes, jr., (*United States Naval Academy*)	Spl.C.E.,	Reading.

SENIOR CLASS

Class of 1923

	Course	Residence
Abel, Stanford Edward,	C.E.,	Washington, D. C.
Acker, Swope,	E.E.,	Baltimore, Md.
Amig, William Van Wert,	M.E.,	Baltimore, Md.
Ancona, Frederick Bechtel,	E.E.,	Reading.
Appel, Carl Wilson,	E.E.,	Allentown.
Asbury, Thomas Henry, 2nd,	Bus.,	Philadelphia.
Bahnsen, Conrad Mortimer,	B.A.,	Nazareth.
Balderson, Robert Power,	Bus.,	Pittsburgh.
Barber, Frederick Edwin,	E.E.,	Allentown.
Barrall, John Kenneth,	B.A.,	Allentown.
Barrell, Robert Webb, jr.,	E.E.,	St. Louis, Mo.
Beale, Edward Belknap,	Ch.E.,	Washington, D. C.
Beck, Rodney Maurer,	Ch.E.,	Philadelphia.
Beitzel, Horace Clifton, jr.,	M.E.,	Moorestown, N. J.
Bessemer, Stephen Joseph,	Bus.,	Bethlehem.
Bieg, Henry Conrad,	E.M.,	Philadelphia.
Bishop, Charles Fletcher,	E.E.,	Williamsport.
Blankenbuehler, John Henry,	E.E.,	Elizabeth.
Bloch, Elmer Morton,	B.A.,	Newport, R. I.
Bobbin, Raymond Joseph,	Bus.,	Shenandoah.
Bodey, Carl Franklin,	E.E.,	Reading.
Borden, George Centennial, jr.,	Ch.E.,	Asbury Park, N. J.
Boyden, Wilson Gordon,	E.E.,	Greenwich, Conn.
Boyer, Willard Albert Solomon,	B.A.,	Lehighton.
Bradley, Clifton Newton,	Bus.,	Brooklyn, N. Y.
Bray, Lennox Jerome,	M.E.,	Westerly, R. I.
Brewer, Warren,	N.E.,	Newton Center, Mass.
Brotzman, Reginald Philip,	E.E.,	Easton.
Burgess, Charles Owen,	Met.,	Niagara Falls, N. Y.
Bush, Charles Roland, jr.,	C.E.,	Washington, D. C.
Callahan, George White Gregory, jr.,	C.E.,	Newport, R. I.
Camm, John Palmer,	E.M.,	Atlantic City, N. J.
Carey, James White, jr.,	M.E.,	Wenonah, N. J.
Carlisle, William Albert,	Bus.,	Luthersburg.
Chisholm, Henry Lewis, jr.,	M.E.,	Buffalo, N. Y.
Christman, Calvin Claude,	B.A.,	Lehighton.

Clarke, David Messer,	C.E.,	Bee Ridge, Fla.
Compher, Wilfred Clinton,	Bus.,	Poolesville, Md.
Conlin, John Francis, jr.,	Bus.,	Philadelphia.
Coxe, Edward Haviland, jr.,	E.E.,	Pittsburgh.
Creighton, Arthur Morgan,	Met.,	Bayonne, N. J.
Cusick, Arthur Cabot,	M.E.,	Roxbury, Mass.
Darsie, James Hazen,	E.M.,	West Homestead.
Davis, Edward Chester,	M.E.,	Taylor.
Day, Harrie Lyon,	Met.,	Ogdensburg, N. Y.
Decker, Everett Judd,	E.M.,	Mountain Lakes, N. J.
Dehnick, Joseph Albert,	C.E.,	Atlantic City, N. J.
DeMoyer, Frank Hart,	C.E.,	Camden, N. J.
DePuy, Stuart Walton,	Ch.E.,	Hammonton, N. J.
Derrick, Charles Luther,	E.E.,	Washington, D. C.
Desh, George Jacob,	B.A.,	Belfast.
Dithridge, Edward Hay,	Ch.E.,	Morrisville.
Dixon, Lyman LeRoy,	E.M.,	Flushing, N. Y.
DuBois, Howard Higbee,	E.M.,	Philadelphia.
Erb, John Edgar,	Met.,	Middletown.
Ertner, Harold Sigmond,	C.E.,	Camden, N. J.
Fancher, Charles Melvin,	N.E.,	Elizabeth, N. J.
Farace, Samuel,	E.E.,	Baltimore, Md.
Farkas, Harold,	Ch.E.,	Newark, N. J.
Fehr, Howard Franklin,	B.A.,	Bethlehem.
Ferguson, Frank Elliott, jr.,	E.E.,	Washington, D. C.
Ferris, Edwin Alden,	M.E.,	Ridgefield Park, N. J.
Ferry, John Francis,	E.E.,	Allentown.
Foot, Cyril Hughes,	M.E.,	Westfield, N. J.
Forney, Charles David,	E.E.,	Hanover.
Forstall, Charles Fletcher,	C.E.,	Rosemont.
Freeman, Carlos Alphonso,	E.M.,	Caracas, Venezuela.
Fuld, Melvin,	E.E.,	Baltimore, Md.
Garber, Meyer Isadore,	Ch.E.,	Norristown.
Gardy, Julian Washington,	Bus.,	Doylestown.
Gentzlinger, Henry Werner,	C.E.,	New York, N. Y.
Getz, David King,	B.A.,	Allentown.
Gihon, Harry David,	M.E.,	Trenton, N. J.
Glasmire, Frederick Wanner,	Ch.E.,	Bethlehem.
Graff, Richard Morris,	E.M.,	Worthington.
Green, Kenneth William,	E.E.,	Weissport.

Groff, Joseph Coblentz,	N.E.,	New York, N. Y.
Hacker, Robert Trost,	E.M.,	Toledo, O.
Hales, Ralph Alonzo,	Ch.E.,	Washington, D. C.
Handwerk, Erwin Casper,	E.M.,	Slate Dale.
Hardcastle, Edward,	E.E.,	Easton, Md.
Harkins, Linus Kenneth,	B.A.,	Homestead.
Hartung, Philip Halstead,	M.E.,	Yonkers, N. Y.
Hauck, Adam Edward,	E.M.,	Buffalo, N. Y.
Heikes, George Conrad,	B.A.,	Salt Lake City, Utah.
Hewitt, Alfred George,	Ch.E.,	Washington, D. C.
Hicks, Albert Willet, jr.,	E.M.,	Allentown.
Hitchner, Adam Hannan,	E.M.,	Woodbury, N. J.
Hoch, Albert Jackson,	Met.,	Reading.
Hoke, William Mason,	E.E.,	Lebanon.
Hornbostel, Lloyd,	M.E.,	Pittsburgh.
Huston, James Stewart,	Met.,	Coatesville.
Israel, Charles Henry, jr.,	Ch.E.,	Philadelphia.
Jacobson, Louis John,	C.E.,	Washington, D. C.
Johnston, Bryon Albert Chapman,	E.M.,	Tompkinsville, N. Y.
Kaman, Samuel Lawrence,	B.A.,	New York, N. Y.
Kehler, Lloyd Benjamin,	M.E.,	Shamokin.
Kennedy, Jamieson Douglas,	B.A.,	North Adams, Mass.
Kilbourn, Willam Robert,	M.E.,	Williamsport.
Killmer, Jack Kaufman,	Met.,	Reading.
Knodel, Charles Gotthilf,	M.E.,	Allentown.
Koch, George Schneider,	E.E.,	Washington, D. C.
Kocher, Walter Merritt,	C.E.,	Allentown.
Kramer, Allan Reuel,	E.E.,	Coplay.
Kratz, Wilbur,	M.E.,	Baltimore, Md.
Kreisel, John Werner,	B.A.,	Pen Argyl.
Kressler, Charles Horner,	E.E.,	Finesville, N. J.
Kurtz, Irwin Faust,	C.E.,	Pottstown.
Kutzleb, Richard, jr.,	M.E.,	Baltimore, Md.
Lambert, Tilghman Albert,	B.A.,	Bethlehem.
Larkin, Paul Revere,	C.E.,	Wallaston, Mass.
Larkin, Sylvester Makens,	C.E.,	Norristown.
Laughton, William Miller,	Met.,	Washington, D. C.
Lebovitz, Samuel Llewellyn,	E.M.,	Baltimore, Md.
Lees, John Luther,	C.E.,	Hellertown.

Leister, Frank Henry, jr.,	C.E.,	North Wales.
Lewis, Frederick William,	B.A.,	Pottsville.
Light, Joel Longenecker,	E.M.,	Allentown.
Lodge, Friend Horace,	C.E.,	Philadelphia.
McConnell, George D.,	Bus.,	Butler.
McFadden, Michael Charles Joseph,	Met.,	Bethlehem.
McPherson, John Douglas, 3rd,	E.E.,	Fair Oaks, Cal.
Magruder, Elbert Tyler,	M.E.,	Winchester, Va.
Mattson, William Raymond,	C.E.,	Rockledge.
Mecaslin, Harry Benton, jr.,	E.E.,	Baltimore, Md.
deMenezes, Godofredo Moraes,	C.E.,	Aracaju, Sergipe, Brazil.
Miller, Charles Heck,	Ch.E.,	Philadelphia.
Minnich, Charles Raymond,	C.E.,	Robesonia.
Minnich, Joseph Pilkay,	E.E.,	Harrisburg.
Mitman, Frederick Snyder,	E.M.,	Bethlehem.
Mitman, Harry Ammon,	Ch.E.,	Northampton.
Molloy, James Xavier,	N.E.,	Bridgeport, Conn.
Moyer, Joseph Fretz,	C.E.,	Quakertown.
Muirhead, Andrew Wilson,	M.E.,	Bridgeport, Conn.
Muschlitz, Wilbert David,	B.A.,	Bethlehem.
Muzdakis, John Robert,	E.E.,	Baltimore, Md.
Nadig, Stanton Elwell,	N.E.,	Allentown.
Nevins, Samuel Craig,	Ch.E.,	Tamaqua.
Newlin, James Memmert,	E.M.,	Sparrows Point, Md.
O'Keefe, Francis Callistus,	Bus.,	Rockville, Conn.
Olcott, John Hedrick,	C.E.,	Glencarlyn, Va.
Old, Marcus Calvin,	B.A.,	Allentown.
Opdycke, John Hinkle,	Bus.,	Philadelphia.
Petersen, Theodore Otto,	Ch.E.,	Philadelphia.
Pfahler, Robert Gair,	E.M.,	Wilkes-Barre.
Picht, George Christopher, jr.,	E.E.,	Bethlehem.
Pill, Frank, jr.,	B.A.,	Califon, N. J.
Quick, Donald Mott,	M.E.,	Yonkers, N. Y.
Quier, Kenneth Elwell,	M.E.,	Bethlehem.
Randall, Harradon Reets,	E.M.,	Shamokin.
Read, John Mason,	C.E.,	Washington, D. C.
Redington, Joseph Patrick,	Bus.,	Wilkes-Barre.
Regad, Eugene Desire,	E.E.,	Irvington, N. J.

Reiter, Irvin Sterner,	Met.,	Bethlehem.
Rhoades, Ronald Sage,	E.M.,	Nutley, N. J.
Rhoads, Byron Elmer, jr.,	C.E.,	Big Stone Gap, Va.
Richards, Elmer Lincoln, jr.,	C.E.,	Somerville, N. J.
Rieman, Edwin Frederick,	E.E.,	Tamaqua.
Riley, John Stephen,	E.E.,	Willimantic, Conn.
Robinson, John Bunyan,	E.M.,	Chester.
Roller, Oscar Frederic, jr.,	Ch.E.,	Philadelphia.
Rubba, Russell,	Ch.E.,	Hammonton, N. J.
Ruger, Raymond Philip,	C.E.,	Philadelphia.
Sansom, Edward Marsh,	Ch.E.,	Cranford, N. J.
Schaefer, Everett Gordon,	Ch.E.,	New York, N. Y.
Schifreen, Clement Solomon,	E.E.,	Catasauqua.
Schragger, Charles Nelson,	Ch.E.,	Trenton, N. J.
Schrauff, Henry John,	E.M.,	Jersey City, N. J.
Schwab, Thomas Wesley, jr.,	B.A.,	Bath.
Schwarzbach, Alvin August Claus,	E.M.,	Newark, N. J.
Sheetz, Olin Curtis,	Met.,	Philadelphia.
Shoemaker, Lewis Foulke, jr.,	C.E.,	Devon.
Siemann, Arthur Louis,	C.E.,	Brooklyn, N. Y.
Smith, Hubert Bell,	C.E.,	Philadelphia.
Smith, Thomas Cameron,	M.E.,	Allentown.
Snyder, Edwin Henry, jr.,	E.E.,	Washington, D. C.
Stanier, John Stewart,	Bus.,	Tarentum.
Stanley, Leslie Wright,	B.A.,	Williamsport.
Stanton, Thomas William,	Bus.,	Montclair, N. J.
Steiner, William Joseph Henry,	Bus.,	New York, N. Y .
Taylor, John Wright, jr.,	M.E.,	Century, Fla.
Thomas, John Archibald,	E.M.,	Scranton.
Thompson, William Gardiner,	E.M.,	Richmond Hill, N. Y.
Tilghman, Richard Haughton,	M.E.,	Overlea, Md.
Todd, James Arnold,	Ch.E.,	Doylestown.
Underwood, Herbert Francis,	M.E.,	Brooklyn, N. Y.
Van Billiard, Lewis Howard,	E.E.,	Bethlehem.
Van Keuren, Edwin,	B.A.,	Bethlehem.
Van Ness, John Harold,	C.E.,	Paterson, N. J.
Voss, Charles Abbott,	Bus.,	Brooklyn, N. Y.
Walker, Percy Franklin,	C.E.,	Harrisburg.
Wallace, Edward Allen, jr.,	Bus.,	Grand Rapids, Mich.

Walters, Frank Clayton,	N.E.,	Bethlehem.
Walters, George Wilmer,	E.M.,	Cazenovia, N. Y.
Walton, Joseph Edward,	C.E.,	Bethlehem.
Webb, Robert Stanford,	M.E.,	Asheville, N. C.
Wentz, James,	Bus.,	New York, N. Y.
Werner, David Thomas,	E.E.,	Lebanon.
Wight, Donald Miller,	M.E.,	Washington, D. C .
Wilkins, Paul Edwin,	C.E.,	Baltimore, Md.
Wingate, Bruce Kuglow,	C.E.,	Reading.
Wire, Charles Raymond,	C.E.,	Washington, D. C.
Wolensky, Barney Louis,	Bus.,	Palmerton.
Wuetrich, Adolph Gustave,	Met.,	Perth Amboy N. J.
Yeide, Harry Elwood,	E.E.,	Weatherly.

JUNIOR CLASS

Class of 1924

	Course	Residence
Abel, George Justin,	M.E.,	Elizabeth, N. J.
Adams, Edgar Thomas, jr.,	E.M.,	Crafton.
Alford, Charles Mahin,	E.E.,	East Orange, N. J.
Allan, Robert Houston,	Bus.,	Jermyn.
Alwine, Charles Emory,	E.E.,	New Oxford.
Ayers, William DeWitt,	C.E.,	Branchville, N. J.
Baker, Ernest Wellington,	E.E.,	Harrisburg.
Benner, Ralph Chalfont,	M.E.,	Atglen.
Bennett, Edmund Van Gilder,	Met.,	Lansdale.
Bishop, Morris Earl,	B.A.,	Bethlehem.
Boggs, George Warren,	Bus.,	Melrose Park.
Bond, Louis Boutell,	M.E.,	Philadelphia.
Bond, Luther Gerber, jr.,	M.E.,	York.
Bonney, Henry Ernest,	B.A.,	Pen Argyl.
Bortz, Carl Martin,	Bus.,	Pittsburgh.
Boyd, James Andrew,	Bus.,	Montvale, N. J.
Boyle, Joseph, jr.,	Bus.,	Paterson, N. J.
Bridegam, Warren James,	E.E.,	Reading.
Brookfield, Frederic	Met.,	Syracuse, N. Y.
Buck, Richard Joseph,	B.A.,	Bethlehem.
Bugbee, Jesse Albert,	C.E.,	Trenton, N. J.
Bumbaugh, Frank Taylor,	Met.,	Monessen.
Burt, Paul Shafter,	Bus.,	Washington, D. C.

Campbell, Paul Frederick,	C.E.,	Swedesboro, N. J.
Campbell, William Brunner,	Bus.,	Lebanon.
Canavan, William Paul,	B.A.,	Chester.
Carol, José Maria,	C.E.,	Cardenas, Cuba.
Carpenter, Henry Bartleson, jr.,	M.E.,	Montclair, N. J.
Carter, Norman Campbell,	Chem.,	Phoenixville.
Chang, Kuang-Ming,	Met.,	Shanghai, China.
Cluthe, Carl, 3rd,	Bus.,	Glen Ridge, N. J.
Coleman, Douglas Fleming,	B.A.,	Jersey City, N. J.
Conley, Thomas George, jr.,	E.M.,	Pittsburgh.
Cornelius, Charles Taylor,	M.E.,	Pittsburgh.
Cornelius, George Emil Wagner,	Bus.,	McKeesport.
Cottman, Llewellyn Powell,	Ch.E.,	Baltimore, Md.
Craig, Thomas Benneville,	M.E.,	Slatington.
Cupp, Laylon Lavern,	M.E.,	Williamsport.
Danko, John Vincent,	E.M.,	Port Chester, N. Y.
Davis, William Shaff, jr.,	E.M.,	Lebanon.
Degnan, James Michael, jr.,	E.E.,	Bethlehem.
DiBiase, James,	Bus.,	Newark, N. J.
Dick, Donald Benner,	Bus.,	Hazleton.
Diener, Walter Miller,	M.E.,	Hamburg.
Dietrick, Robert Charles,	B.A.,	High Bridge, N. J.
Dietz, Joseph Budding,	Ch.E.,	Lancaster.
DiGuilian, Attilio Peter,	C.E.,	Washington, D. C.
Donaldson, Kenneth,	C.E.,	Washington, D. C.
Drake, William Robert,	C.E.,	Reading.
Edson, Warren Newton,	C.E.,	Scranton.
Emanuel, Robert Samuel,	M.E.,	Nesquehoning.
Emerson, Ralph Waldo,	B.A.,	Ridgefield Park, N. J.
Ennis, Robert William,	C.E.,	Mount Penn.
Fegley, Claud Andrew,	B.A.,	Bethlehem.
Fleck, Paul Butler,	E.M.,	Pittsburgh.
Focht, Louis Doster,	E.M.,	Trenton, N. J.
Foster, Arthur Lee,	E.E.,	Allentown.
Fritzsche, Otto Herbert Adolph,	C.E.,	Irvington, N. J.
Galloway, Beverly Stewart,	B.A.,	Takoma Park, D. C.
Ganey, Thomas Vincent,	Bus.,	Bethlehem.
Gee, Elisha, jr.,	B.A.,	Denver, Col.
Gerhart, Paul Leroy,	E.E.,	Reading.
Glen, Maxwell,	Bus.,	Newbury, Mass.

Gorham, Edward Werrey,	Ch.E.,	Brooklyn, N. Y.
Grace, Carroll Brewster, jr.,	M.E.,	Philadelphia.
Graham, George Tinsley,	Bus.,	Bethlehem.
Grambs, George Lorenzo,	B.A.,	Scranton.
Greer, Harry Ross,	B.A.,	Atlanta, Ga.
Grim, James Stewart, jr.,	E.E.,	Kutztown.
Hagenbuch, Edward Allen, jr.,	E.E.,	Allentown.
Hampton, George,	Ch.E.,	Bridgeton, N. J.
Harper, Robert Malcolm,	Bus.,	Butler.
Hartmann, Edward Paul,	Met.,	Bethlehem.
Hauser, Roderick Ritter,	Bus.,	Allentown.
Hauser, Stanley LeRoy,	Met.,	Kutztown.
Hawkins, Richard Arthur,	E.M.,	Forty Fort.
Heckert, Robert Augustus,	B.A.,	Brackenridge.
Heimbrook, Charles Albert,	Bus.,	Bethlehem.
Hendrickson, Francis Lynn,	E.M.,	Woodbury, N. J.
Henry, Eugene Harvey, jr.,	C.E.,	Lancaster.
Henschen, Leroy,	E.E.,	Baltimore, Md.
Heske, Walter Gottlieb,	Met.,	Bethlehem.
Hewson, Edward Haskell,	N.E.,	Madison, N. J.
Hiller, Charles Francis,	B.A.,	Buchanan, Mich.
Hoagland, Dan Parmlee, jr.,	B.A.,	Bayonne, N. J.
Hoffman, William Jacob,	B.A.,	Raubsville.
Homeyer, William Henry,	B.A.,	Jersey City, N. J.
Hopkins, George Whitefield,	M.E.,	Cleveland, O.
Hottinger, Alwin Julius,	Met.,	Kenvil, N. J.
Howell, Richard Paulmier,	E.M.,	Bethlehem.
Huggins, George Allen,	Bus.,	Fanwood, N. J.
Hunter, Francis Alexander,	M.E.,	Hoboken, N. J.
Jamieson, John Jay Ivory,	Met.,	Frackville.
Jamison, Earl Helmes,	M.E.,	Hazleton.
Jenkins, George French,	E.M.,	Binghamton, N. Y.
Johnson, Alfred William,	E.E.,	West Hartford, Conn.
Johnson, Sidney Edward,	Bus.,	Dayton, O.
Jones, Gordon Tyron,	B.A.,	Edwardsville.
Kasper, Ralph Joseph,	N.E.,	Ridgefield, Conn.
Kemmerer, Walter William,	B.A.,	Wind Gap.
Kichline, William Levi,	B.A.,	Bethlehem.
Kiefer, Herman Eugene, jr.,	C.E.,	Quincy, Ill.
Kitchen, John C., jr.,	Ch.E.,	Columbia, N. J.

Klein, Walter Conrad,	B.A.,	Pottsville.
Klippel, Earl Frederick,	E.E.,	Bethlehem.
Knouse, Walter Earl,	E.E.,	Washington.
Kravitz, Raphael,	E.M.,	Atlantic City, N. J.
Langfitt, James Porter,	B.A.,	Parkersville, W. Va.
Laux, George August,	M.E.,	Baltimore, Md.
Laux, Louis Albert,	M.E.,	Baltimore, Md.
Levy, Bertram Rich,	E.E.,	Brooklyn, N. Y.
Lewis, John Herbert,	C.E.,	North Wales.
Light, Berlin Carl,	Ch.E.,	Reading.
Linaberry, Stanley Simrell,	C.E.,	Columbia, N. J.
Lingle, Charles Fitting,	Bus.,	Harrisburg.
Litke, Harry Theodore,	C.E.,	Millville, N. J.
Long, Willoughby James,	Met.,	Bethlehem.
Lord, Edward Thomas Warren,	Ch.E.,	Philadelphia.
Luce, Donald Cameron,	E.E.,	Scranton.
MacKenzie, Adrian Morell,	Bus.,	Englewood, N. J.
McBride, John Leo,	B.A.,	Phillipsburg, N. J.
McBride, Joseph Aloysius,	M.E.,	Philadelphia.
McIntire, Robert Lester,	Bus.,	Butler.
Mackenzie, Sidney Thompson,	N.E.,	Philadelphia.
Maguire, Joseph Anthony,	B.A.,	Vineland, N. J.
Major, William Samuel,	Ch.E.,	Roebling, N. J.
Mandell, Leon Nathaniel,	Ch.E.,	Philadelphia.
Martin, Frederic Thurman,	Ch.E.,	Harrisburg.
Master, Warren S.,	E.E.,	Reading.
Maxwell, Thomas,	E.E.,	Baltimore, Md.
Mechling, John Younkins,	M.E.,	Casper, Wyo.
Mellinger, Albert Charles, jr.,	B.A.,	Bethlehem.
Mercur, Robert Sayre,	E.M.,	Harrisburg.
Metzner, Russell Henry,	M.E.,	Wheeling, W. Va.
Meyer, William Charles,	E.E.,	Bethlehem.
Miller, Philip Robert,	B.A.,	Bethlehem.
Miller, William Hurxthal,	E.E.,	Glendale, O.
Milligan, John Ralph,	Bus.,	East Liverpool, O.
Minster, Pemberton Foster,	Bus.,	Bristol.
Mitchell, Charles Bayard, 2nd,	E.M.,	Woodbury, N. J.
Moore, Myron Turner,	Bus.,	Youngstown, O.
Morgan, Josiah Dodson,	E.E.,	Allentown.
Morgan, William John,	Bus.,	Bethlehem.

Northup, Maynard Sanborn,	Met.,	Allentown.
Palmer, Henry Parsons,	C.E.,	Langhorne.
Parker, Joseph Henry,	Bus.,	Milwaukee, Wis.
Parsons, Donald Adelbert,	M.E.,	New Rochelle.
Patterson, John Alexander, jr.,	Ch.E.,	Philadelphia.
Paxton, George Benjamin,	E.E.,	Harrisburg.
Pearson, Frederick Joseph,	B.A.,	Wilkes-Barre.
Penwell, Max Kenneth,	E.M.,	Pana, Ill.
Piersol, John Marshall,	E.M.,	Philadelphia.
Platt, Robert,	Ch.E.,	Westfield, N. J.
Plumb, Rollo Green,	B.A.,	Bethlehem.
Quinlan, Eldridge Edward,	Bus.,	Newark, N. J.
Rakestraw, Theodore Horace,	E.M.,	Mechanicsburg.
Ratajczak, Frank Xavier,	E.E.,	Reading.
Redline, Paul Wilson,	E.M.,	Bethlehem.
Reese, Benjamin Harvey,	Bus.,	Kingston.
Reilly, John Kennedy,	Bus.,	Spangler.
Reyer, William Aaron,	Ch.E.,	Northampton.
Reynolds, Joseph Lee,	E.M.,	Kingston.
Rice, Charles Lewis,	C.E.,	Hazleton.
Rice, Janvier Mayhew,	E.E.,	Bridgeton, N. J.
Richards, Louis Moore,	M.E.,	Somerville, N. J.
Richardson, Edward Hardy,	C.E.,	Malvern.
Ritter, Ralph Shelly,	E.E.,	Quakertown.
Roberts, Arthur Parsons,	Bus.,	Englewood, N. J.
Robinson, Edmund Lewis,	E.E.,	Bethlehem.
Robinson, Harry George,	M.E.,	Trenton, N. J.
Robinson, John Mealy,	M.E.,	Pittsburgh.
Rogers, Henry Gordon,	Ch.E.,	Newark, N. J.
Rogers, John Frederick,	Bus.,	Buffalo, N. Y.
Rohrer, Henry Augustus,	M.E.,	Lancaster.
Ross, Jack Elton,	C.E.,	Newark, N. J.
Rouch, Ernest Allen,	M.E.,	York.
Ryan, Michael Joseph, jr.,	B.A.,	Bethlehem.
Sanford, James Leo,	B.A.,	Long Beach, N. Y.
Sattenstein, Sidney Lincoln,	E.E.,	Reading.
Saunders, Oliver Hubbard, jr.,	M.E.,	Brooklyn, N. Y.
Sayre, Austin Bartholomew,	B.A.,	Glen Ridge, N. J.
Schaffer, George Washington,	Met.,	Allentown.
Scheetz, Edwin Freed,	E.M.,	Wyncote.

Schleicher, Wallace Mengel,	N.E.,	Maplewood, N. J.
Schultz, Albert Novinger,	E.E.,	Williamsport.
Schwartz, Paul Englehart,	Bus.,	Harrisburg.
Settle, Richard Torpin,	E.M.,	Drexel Hill.
Shigo, John Joseph, jr.,	B.A.,	Hazleton.
Simmons, John Stegner,	E.M.,	Scranton.
Skeels, Walter Simeon,	E.M.,	Rochester, N. Y.
Smith, Leslie Ewart,	E.M.,	East Mauch Chunk.
Snyder, Amandus Deischer, jr.,	Ch.E.,	Pennsburg.
Snyder, Frederick Deppen,	Ch.E.,	Harrisburg.
Springsteen, Arthur Wellington,	B.A.,	Detroit, Mich.
Springsteen, William Watson,	Bus.,	Detroit, Mich.
Stauffer, Edwin Lewis,	Ch.E.,	Northampton.
Stern, Paul Hertzler,	B.A.,	Elizabethtown.
Stille, Francis Carroll,	E.M.,	Woodbury, N. J.
Strawn, Eli Howard,	C.E.,	Quakertown.
Swartley, John Cassel, jr.,	B.A.,	Doylestown.
Swartz, Ralph Christian,	M.E.,	Allentown.
Talmage, Herbert Richard,	C.E.,	Irvington, N. J.
Thayer, James Stansbury,	M.E.,	Baltimore, Md.
Thompson, Walter Scott,	E.E.,	Sunbury.
Tonking, Russell,	Ch.E.,	Dover, N. J.
Troland, Hugh More, jr.,	C.E.,	Philadelphia.
Troutman, Roy Ezra,	Ch.E.,	Bethlehem.
Tuggey, John Mitchell, jr.,	B.A.,	Bethlehem.
Underwood, Ralph Edward,	B.A.,	Brooklyn, N. Y.
Urban, Stanley Joseph,	E.M.,	Allentown.
Van Dyke, John Harrison,	M.E.,	Pittsburgh.
Warriner, Ruel Dexter,	E.M.,	Philadelphia.
Wasser, Floyd Henry,	Met.,	Bethlehem.
Wehrenberg, William, jr.,	E.E.,	Baltimore, Md.
Wentz, Graham,	Ch.E.,	Scranton.
Werft, Ellis Lincoln,	E.M.,	Altoona.
Wiegner, Andrew Newton,	C.E.,	Bethlehem.
Wood, Arthur,	B.A.,	Providence, R. I.
Woodrow, Maurice Orr,	C.E.,	Wilkes-Barre.
Wooldridge, William Potter,	E.M.,	Pittsburgh.
York, Warren Webster,	Bus.,	Scranton.
Yuan, Tung,	E.M.,	Pekin, China.
Zannaras, John Phillip,	N.E.,	Chios, Greece.

SOPHOMORE CLASS

Class of 1925

	COURSE	RESIDENCE
Adams, Robert Burnette,	Bus..	Brockton, Mass.
Akialis, Joseph Michael,	Ch.E.,	Newark, N. J.
Allen, Charles Wesley,	E.M.,	Reading.
Allen, Walter Rue,	E.E.,	East Orange, N. J.
Angulo, David,	C.E.,	Barranquilla, Colombia, S. A.
Astarita, Francis Sandford,	Bus.,	Loch Arbor, N. J.
Austin, James Bliss,	Ch.E.,	Chicago, Ill.
Ayres, Clarence Cornelius,	E.E.,	Chester.
Barnes, John Francis,	E.M.,	New Paltz, N. Y.
Barton, Frederick Charles, jr.,	Bus.,	Tenafly, N. J.
Batz, Kenneth William Yates,	M.E.,	Stapleton, N. Y.
Bayles, Allison Lerch,	M.E.,	Charleston, S. C.
Beck, Frederick Charles,	E.E.,	Philadelphia.
Beggs, Charles Wendell,	Ch.E.,	Wilkinsburg.
Behr, William John, jr.,	N.E.,	Montclair, N. J.
Berg, Frederick Christian,	N.E.,	Philadelphia.
Bergen, Howard Beekman,	E.E.,	Newtown.
Bergen, Lewis Spaden,	E.M.,	Matawan, N. J.
Berger, Francis Joseph,	E.E.,	Wilkes-Barre.
Bevan, James Elmer,	E.E.,	Frackville.
Bidwell, James Truman,	B.A.,	Portland, Ore.
Binkley, Edward Lehman,	E.E.,	Hagerstown, Md.
Bokum, William Harold,	E.E.,	Philadelphia.
Borda, Russell Berger,	Bus.,	Schuylkill Haven.
Borden, Robert Oswald,	M.E.,	Bentonville, Va.
Bowman, John Gheen,	C.E.,	Bethlehem.
Britt, Therman Paul,	Bus.,	Rydal.
Brooks, Charles Emery,	M.E.,	Glen Ridge, N. J.
Brown, Ernest Embich,	E.E.,	Lebanon.
Brown, Merritt Weaver,	B.A.,	Bethlehem.
Bunn, George William,	B.A.,	East Stroudsburg.
Burke, Edmund Michael,	C.E.,	West Pittston.
Burnes, William Ryan,	C.E.,	Port Chester, N. Y.
Burton, John Taylor,	C.E.,	Philadelphia.
Callow, Michael John,	Met.,	New York, N. Y.
Campbell, Andrew Hiester,	C.E.,	Pottstown.

Castleman, Francis Lee, jr.,	B.A.,	Philadelphia.
Chambers, Harold Bair,	Met.,	Lancaster.
Cheel, Robert Duncan,	M.E.,	Ridgewood, N. J.
Cohen, Milford Hersh,	Ch.E.,	Charleston, W. Va.
Colclough, William Frederick, jr.,	B.A.,	Catasauqua.
Cook, Nevin John,	B.A.,	Drums.
Cottrell, Joseph Donald,	Ch.E.,	Takoma Park, D. C.
Coulton, John Marshall,	C.E.,	Red Bank, N. J.
Craig, John Horner,	Ch.E.,	Slatington.
Croll, John Harold,	E.M.,	Steelton.
Curtis, Edward Aloysius,	E.E.,	Lambertville, N. J.
Davis, James Hornor, 2nd,	B.A.,	Clarksburg, W. Va.
Davis, Richard Light,	E.M.,	Lebanon.
Day, Hugh Taylor,	B.A.,	Philadelphia.
Deck, Ausben Riege,	Ch.E.,	Dover, N. J.
Dickinson, Ansel Reed,	E.E.,	East Whately, Mass.
Dietrich, Horace Wilcox,	C.E.,	Baltimore, Md.
Dinkey, Charles Eugene, jr.,	E.M.,	Pittsburgh.
Dorton, Frederick Babcock,	B.A.,	Baltimore, Md.
Douglass, Norman Engleman,	Chem.,	Ambridge.
Drury, William George,	C.E.,	West Pittston.
DuBois, Allen Corson,	B.A.,	Clayton, N. J.
Dykes, Henri Victor de Puis,	B.A.,	Bethlehem.
Eckfeldt, James Trousselle,	E.M.,	Bethlehem.
Egolf, Harry Louis, jr.,	E.M.,	Philadelphia.
Elicker, Charles Robert,	B.A.,	Roselle Park, N. J.
Elmer, Robert William,	E.E.,	Bridgeton, N. J.
Entrekin, Paul Britton,	E.E.,	Swarthmore.
Everhart, John Lawrence,	Ch.E.,	Bethlehem.
Ewart, Roswell Horr,	Ch.E.,	North Plainfield, N. J.
Feick, Rufus Daniel,	Ch.E.,	Kutztown.
Finegan, Paul James,	B.A.,	Burlington, N. J.
Fister, Lee Harold,	E.E.,	Reading.
Flory, Curtis Bertram, jr.,	Bus.,	Forest Hills, N. Y.
Forsyth, William Redway,	C.E.,	Trenton, N. J.
Frey, Frank Gustave,	M.E.,	Baltimore, Md.
Franco, Carlos Alberto,	M.E.,	Barranco, Peru.
Fullard, William George,	B.A.,	Brooklyn, N. Y.
Gairns, William Otto,	Ch.E.,	La Grange, Ill.
Gallagher, Charles Barto,	B.A.,	New York, N. Y.

Garbarino, Stephen Lawrence,	Bus.,	Shenandoah.
Garra, Edward Joseph,	B.A.,	White Haven.
Geho, Charles Henry,	Ch.E.,	Hazleton.
Gibson, Kenneth Durward,	Bus.,	Belleville, N. J.
Glenn, Joseph Wooderson, jr.,	E.M,.	Garden City, N. Y.
Gondos, Robert Zoltan,	Ch.E.,	Reading.
Green, Thomas Edgar,	Bus.,	Butler.
Greene, Henry Eckford, jr.,	Bus.,	Amsterdam, N. Y.
Greer, William Chamberlain, jr.,	Bus.,	Woodbury, N. J.
Groner, Stephen Sheldon,	Bus.,	Syracuse, N. Y.
Gruhn, Arthur Max,	Bus.,	Brooklyn, N. Y.
Gutierrez, Francisco,	M.E.,	Mexico City, Mexico.
Gyourko, Joseph Edward,	M.E.,	Eckley.
Harmon, Herbert Greasen,	E.M.,	Ridgewood, N. J.
Harris, Abraham Buckley,	Ch.E.,	Baltimore, Md.
Hay, Erroll Baldwin, jr.,	M.E.,	Philadelphia.
Hess, Howard Samuel, jr.,	Bus.,	Hellertown.
Holzshu, Charles David,	E.E.,	Cumberland, Md.
Horn, Franklin Lefever,	Bus.,	Allentown.
Howland, George Asbury,	Ch.E.,	Asbury Park, N. J.
Hursh, James Sharpe,	N.E.,	Newville.
Hutchinson, Stuart Buckler,	C.E.,	Bethlehem.
Ingols, Heber Ashe,	Ch.E.,	Newark, N. J.
Isaacs, Kenneth Lothaire,	M.E.,	Scranton.
Jarrett, George Burling,	C.E.,	Haddonfield, N. J.
Jones, Edwin Pitchford, 2nd,	Bus.,	Bellevue.
Jones, William Joseph, jr.,	E.M.,	Narberth.
Keating, Miles James,	Bus.,	Bethlehem.
Keim, John Kenneth,	M.E.,	Bethlehem.
Keller, Edwin Walker,	B.A.,	Allentown.
Keller, Francis Randolph,	E.E.,	Allentown.
Kerr, Harry Knight,	Ch.E.,	Philadelphia.
King, Arthur Stanley,	M.E.,	Toms River, N. J.
Kingham, Laurence Brewster,	Bus.,	East Orange, N. J.
Kinzie, Raymond Horatio,	C.E.,	Tamaqua.
Kirchner, Earl Lorenz,	Ch.E.,	Washington, D. C.
Kittinger, Spencer Colie,	Bus.,	Buffalo, N. Y.
Koegler, George Franz,	B.A.,	New York, N. Y.
Krazinski, Leo Charles,	E.E.,	Mahanoy City.
Krellberg, Alfred,	Bus.,	New York, N. Y.

Lambert, Ralph Arthur,	E.M.,	Bethlehem.
Lang, Elheim,	Ch.E.,	Phoenixville.
Law, James Graham,	Ch.E.,	Bloomsburg.
Lawall, Paul,	E.M.,	Catasauqua.
Leavens, William Barry, jr.,	E.E.,	Maplewood, N. J.
Lee, Russell Werner,	Ch.E.,	Ottawa, Ill.
Leib, James Fulton,	Bus.,	Baltimore, Md.
Lerch, Franklin Stuart,	B.A.,	Freemansburg.
Leshefka, George John,	E.E.,	McAdoo.
Levitz, Max,	Bus.,	New York, N. Y.
Levy, Maurice Bert,	Met.,	Hazleton.
Lewis, Robert,	Bus.,	New York, N. Y.
Ludwig, Edward Henry Barthold,	Ch.E.,	Tompkinsville, N. Y.
Lundberg, George Otto,	M.E.,	Lansing, Mich.
MacFate, Robert Preston,	Ch.E.,	Bethlehem.
McDermott, James Francis,	Bus.,	New York, N. Y.
McKee, John Edwin,	Ch.E.,	Newport.
McKenzie, Alfred Crane,	N.E.,	Brooklyn, N. Y.
McMorris, William Barnhart,	C.E.,	Harrisburg.
McWilliams, Charles Anthony, Sinclair,	N.E.,	New York, N. Y.
Malis, Pincus Robert,	Bus.,	New York, N. Y.
Mann, Lynn Birckhead,	Bus.,	Woodcliff, N. J.
Mayberry, Harold,	Bus.,	Mahanoy City.
Metten, William Murray,	Bus.,	Wilmington, Del.
Michelson, Joseph Percy,	B.A.,	Bethlehem.
Miller, Howard Frederick,	M.E.,	Easton.
Miller, Meyer Morton,	E.M.,	Baltimore, Md.
Moran, Eugene Francis, jr.,	N.E.,	Brooklyn, N. Y.
Moreland, Lester Duane,	M.E.,	Trenton, N. J.
Moritz, George Robert,	Met.,	Allentown.
Myers, John Alfred,	M.E.,	York.
Neely, Frank Rodgers,	B.A.,	Pittsburgh.
Nehemiah, Maurice Albert,	Ch.E.,	Brooklyn, N. Y.
Nicholls, Edward Samuel,	Ch.E.,	Bethlehem.
Nicola, Oliver Peter, jr.,	E.M.,	Pittsburgh.
Noerr, Robert Collyer, jr.,	Ch.E.,	Hartford, Conn.
Norton, Robert Osgood,	M.E.,	South Orange, N. J.
O'Brien, William Coleman,	E.E.,	Washington, D. C.
O'Brien, William Henry, jr.,	Bus.,	Lynbrook, N. Y.

Ogden, John Boyd,	M.E.,	Johnstown.
Orr, Earl Haas,	Met.,	Lansdale.
Palmer, Arthur Carl,	C.E.,	East Orange, N. J.
Palmer, Herbert William,	B.A.,	Pen Argyl.
Parker, Norman Douglas, jr.,	E.E.,	Washington, D. C.
Patrick, Paul David,	E.E.,	Philadelphia.
Patterson, Daniel Walter,	C.E.,	Bethlehem.
Patty, Claibourne Watkins,	E.M.,	Little Rock, Ark.
Pharo, Homer Durand,	Ch.E.,	Bayonne, N. J.
Philips, Harry Kenneth,	Bus.,	Glen Ridge, N. J.
Pineda, Luis Guillermo,	E.E.,	Maracaibo, Venezuela.
Pittenger, Harry Joseph,	E.M.,	Bethlehem.
Pitts, Reginald Shatswell,	Chem.,	Hanover.
Platt, Ellis Halsted,	B.A.,	Washington, D. C.
Platt, Worthington Elmore,	E.M.,	New Haven, Conn.
Polatchek, Jerome Julius,	E.M.,	New York, N. Y.
Porter, Clarence Henry,	M.E.,	Washington, D. C.
Purdy, Victor Moreau,	Met.,	Brooklyn, N. Y.
Rankin, Bryant Loose,	Met.,	Reading.
Ransom, James Dudley,	B.A.,	Jersey City, N .J.
Reid, William Alexander,	M.E.,	Glen Ridge, N. J.
Rice, Hugh Banker,	C.E.,	Roanoke, Va.
Roberts, Carlton Mitchell,	B.A.,	Asbury Park, N. J.
Roberts, Paul Eagon,	B.A.,	Parkersburg, W. Va.
Roecker, Earl Edward,	E.M.,	Phillipsburg, N. J.
Roesch, Alfred Richard,	M.E.,	Jenkintown.
Rorabaugh, Merrill Schaeffer,	E.E.,	New Kensington.
Ross, Rodney Wyckoff,	Bus.,	Asbury Park, N. J.
Rostow, Lawrence,	Ch.E.,	Newark, N. J.
Roth, Milton Samuel,	B.A.,	Butler.
Rowley, Thomas Clarence,	Met.,	New York, N. Y.
Samuels, Fred Herman,	B.A.,	Newark, N. J.
Saxtan, Eugene Harris,	Bus.,	Jersey City, N. J.
Schmoll, Gilbert Henry,	Ch.E.,	Hazleton.
Schneider, Robert Siis,	M.E.,	Richmond Hill, N. Y.
Schock, Harvey Harold,	Ch.E.,	Shartlesville.
Seeley, Robert Inglis,	C.E.,	Keansburg, N. J.
Senior, Palmer Newman,	E.M.,	Bridgeport, Conn.
Serrell, Arthur Harold, jr.,	M.E.,	Brooklyn, N. Y.
Shartle, John Herbert,	C.E.,	Lancaster.

Sholes, Charles Latham,	Bus.,	Short Hills, N. J.
Siebert, John Carl,	Met.,	Bethlehem.
Siegmund, Harry Loew,	Ch.E.,	Harrisburg.
Smith, Morris Sparhawk,	M.E.,	Swarthmore.
Smith, Walter Reynolds,	M.E.,	Carbondale.
Snyder, Martin Edgar,	Bus.,	Plainfield, N. J.
Spalding, Fitzhugh Preston,	M.E.,	Marquette, Mich.
Stahl, Harry Ernest, jr.,	B.A.,	Trenton, N. J.
Stauffer, Willis Keiter,	Bus.,	Bethlehem.
Stazinski, Peter Felix,	M.E.,	Plymouth.
Stelle, Kenneth Lawrence,	Bus.,	Jamaica Plain, Mass.
Storer, John Waddell, jr.,	Bus.,	Wheeling, W. Va.
Stott, Frank Janney,	Bus.,	Philadelphia.
Stover, Arthur Platt,	Ch.E.,	Wilmington, Del.
Street, Theodore Emerson,	N.E.,	Rocky River, O.
Su, Harry Fang Piu,	E.M.,	Amoy, China.
Taylor, Louis Richmond,	E.E.,	Vineland, N. J.
Taylor, Robert Sayre, jr.,	B.A.,	Bethlehem.
Taylor, Thomas Frederic,	C.E.,	Bangor.
Thomas, Williams Howard Holland,	B.A.,	New Haven, Conn.
Thornburg, Richard Beaumont,	B.A.,	Bethlehem.
Titus, Charles Fischer,	B.A.,	Closter, N. J.
Torrance, George,	E.M.,	Pontiac, Ill.
Trumbore, Clark Richard,	B.A.,	Bethlehem.
Trushel, Willard Carl,	B.A.,	Warren.
Tyler, Walter Simeon, jr.,	Ch.E.,	Bridgeport, Conn.
Underwood, Lloyd Fletcher,	Ch.E.,	Chatham, N. J.
Unkles, John Jacob,	Bus.,	East Orange, N. J.
VanNostrand, Erwin Skidmore, jr.,	M.E.,	Toms River, N. J.
Verlenden, John Boyd,	C.E.,	Darby.
Volkmar, Karl,	C.E.,	Williamsport.
Waldron, John Wesley,	Ch.E.,	Philadelphia.
Walker, William Higham,	E.M.,	Riverside, N. J.
Wallace, Kenneth Campbell,	Ch.E.,	Bridgeport, Conn.
Waltman, John Richard,	B.A.,	Bethlehem.
Wardell, Weston Burnet,	Bus.,	East Orange, N. J.
Washburn, Lindsley Morgan,	Bus.,	Wilkes-Barre.
Weissenborn, Albert Edward,	E.M.,	Montclair, N. J.
Welch, Hiester Jacob,	N.E.,	Elmira, N. Y.

Wettereau, Paul Christian,	Ch.E.,	Hazleton.
Williams, Laurens Augustine Peter,	E.E.,	Woodstock, Vt.
Wilmot, George Lincoln,	Met.,	Hazleton.
Wolcott, Leslie Carl,	E.E.,	Warren, O.
Wurster, Luther Conrad,	E.E.,	Harrisburg.

FRESHMAN CLASS

Class of 1926

	COURSE	RESIDENCE
Alden, Charles Whiting,	E.M.,	Steelton.
Allard, Charles Norman,	Ch.E.,	Wildwood, N. J.
Althouse, Ernest Emanuel,	E.E.,	Hamburg.
Alwine, John Crock,	Bus.,	Greensburg.
Ambler Charles Merrill,	Bus.,	Abington.
Anderson, Paul Sutro,	Bus.,	New York, N .Y.
Applegate, William McLean,	E.E.,	Red Bank, N. J.
Ash, Charles Elwood, jr.,	M.E.,	Kingston.
Atwood, Henry Martyn,	E.E.,	New Rochelle, N. Y.
Aykroyd, Marshall John,	M.E.,	Bethlehem.
Ayers, Elwood Bowers, jr.,	M.E.,	Melrose Park.
Bachman, George, jr.,	C.E.,	Camden, N. J.
Bachman, Joseph Peter, jr.,	Bus.,	Allentown.
Bates, David Brooks,	M.E.,	Beaver.
Bauer, Fred Arthur,	B.A.,	Lakewood, N. Y.
Bayard, Arnold Aaron,	M.E.,	Philadelphia.
Bell, Davitt Stranahan,	M.E.,	Pittsburgh.
Bigley, James Warren,	E.E.,	Kingston.
Binai, Rong,	E.E.,	Bangkok, Siam.
Bingle, Francis Xavier,	Bus.,	New York, N. Y.
Bishop, Bruce Hunter,	M.E.,	Scranton.
Board, Cornelius Zabriskie,	E.E.,	Ridgewood, N. J.
Bond, Nelson Leighton,	Bus.,	Caldwell, N. J.
Borneman, Walter Houck,	E.E.,	Millville, N. J.
Boush, Gilbert Wesley,	E.M.,	Harrisburg.
Bradley, Frederick William,	B.A.,	Trenton, N. J.
Bridge, Ernest Laithwaite,	B.A.,	Glen Ridge, N. J.
Brill, Fred Augustus, jr.,	Ch.E.,	Swarthmore.
Brinser, Donald Christian,	Ch.E.,	Harrisburg.
Broome, Ross Alexander,	Bus.,	Scranton.

Brown, Leroy Augustus,	C.E.,	Allentown.
Brown, Willard Marshall,	Ch.E.,	Palmerton.
Brown, William Nicholas,	E.E.,	Brooklyn, N. Y.
Buell, David Clinton, jr.,	E.M.,	Middletown, N. Y.
Buenning, Carl Anthony,	E.E.,	Easton.
Bunnell, Nelson Smith,	Bus.,	Dalton.
Burgess, Henry Russell,	C.E.,	Pittsburgh.
Burlingame, Gordon Matthew,	M.E.,	Bryn Mawr.
Burnham, William,	N.E.,	Harrisburg.
Bushar, Harold Gordon,	C.E.,	Pottsville.
Butler, Joseph Paul,	Bus.,	Pittsburgh.
Cahill, John Joseph,	B.A.,	New York, N. Y.
Campbell, James Edward, jr.,	Ch.E.,	New York, N. Y.
Canfield, Donald,	Bus.,	Caldwell, N. J.
Carruth, Clarence Edgar, jr.,	Bus.,	DuBois.
Case, Rowland Bertram,	M.E.,	Phillipsburg, N. J.
Cetina, Renan,	E.E.,	Vera Cruz, Mexico.
Chadwick, Howard Cornelius,	Bus.,	Woodbury, N. J.
Chew, Edmund Freeman,	M.E.,	Mantua, N. J.
Childs, Frank Lawton,	Bus.,	New York, N. Y.
Childs, James Lawton,	Bus.,	New York, N. Y.
Clark, Ralph Waldo,	M.E.,	Factoryville.
Coleman, Fred Edward,	Bus.,	Northampton.
Comstock, Clinton Samuel,	M.E.,	Glenrock, N. J.
Cooke, Theodore, 3rd,	Bus.,	Pikesville, Md.
Coombs, Melville Martin,	M.E.,	Brooklyn, N. Y.
Cornwell, Edward Fahnestock,	C.E.,	West Chester.
Corson, Osman Myron,	E.E.,	Cape May Court House, N. J.
Cottman, William Watson, jr.,	M.E.,	New Hope.
Couch, Leonard Huguenor,	Bus.,	Buffalo, N. Y.
Cree, Walter Mitchell,	Bus.,	Pittsburgh.
Cressman, Paul Kreidler,	B.A.,	Bethlehem.
Cresswell, Herbert,	M.E.,	Scranton.
Cryder, William Adams,	E.E.,	Berwick.
Cumming, Benjamin Wilson,	Bus.,	Pottsville.
Cyphers, Kenneth Alexander,	M.E.,	Bethlehem.
Dalgleish, Robert Hamilton, jr.,	M.E.,	Washington, D. C.
Dancy, John Lloyd,	C.E.,	Phoenixville.
Davis, Clyde, 2nd,	Bus.,	Pittsburgh.

DeHart, Charles Thompson,	Bus.,	Thorofare, N. J.
DeLong, William Fox,	E.E.,	Philadelphia.
DeWitt, William Carpenter, jr.,	M.E.,	Phillipsburg, N. J.
Dietrich, Henry Buckley,	Bus.,	Baltimore, Md.
Dunn, Robert Clarence,	C.E.,	Park Ridge, N. J.
Dutt, Loris Merrill,	B.A.,	Bangor.
Dwyer, William Joseph,	Bus.,	Bethlehem.
Dyson, Robert Harris,	E.E.,	Washington, D. C.
Eagleton, Sterling Paul,	M.E.,	Cleveland, O.
Earle, John Goldsborough,	N.E.,	Easton, Md.
Elliott, Lewis Charles, jr.,	C.E.,	York.
Ellis, Franklin Griffith,	Ch.E.,	Allentown.
Enstice, Lyall Robert,	Bus.,	Arlington, N. J.
Epstein, Benjamin Maurice,	Bus.,	Easton.
Evans, Merle Albert,	E.M.,	Ebensburg.
Faga, Edgar Monroe,	Bus.,	Bethlehem.
Farley, Walter Reynolds,	Bus.,	Erie.
Ferris, Irving Miester,	M.E.,	New York, N. Y.
Fitzgerald, Edward Francis,	E.E.,	Northport, N. Y.
Flammer, Russell Bernhard,	Bus.,	Bethlehem.
Forbes, Joseph Palmer,	C.E.,	Chambersburg.
Ford, John Albert,	B.A.,	Phoenixville.
Fouchaux, Julien Ellis,	E.E.,	Paterson, N. J.
Fountain, Robert Fielder, jr.,	Bus.,	South River, N. J.
Fraivillig, Leonard Martin,	C.E.,	Bethlehem.
Frasca, Modestino John,	B.A.,	Stamford, Conn.
Frauenheim, Richard Joseph,	Bus.,	Pittsburgh.
Freeman, Robert Edgar,	Bus.,	Camden, N. J.
Friebely, Carl Daniel,	Bus.,	Bethlehem.
Fulton, Arthur Logan,	B.A.,	Catasauqua.
Gardner, George William Fall,	Bus.,	New York, N. Y.
Geyer, Philip, 3rd,	B.A.,	Brooklyn, N. Y.
Gibb, John Valentine,	E.E.,	Haddon Heights, N. J.
Giles, Edward Maynard,	Ch.E.,	Paterson, N. J.
Gill, Albert Benoist, jr.,	N.E.,	Bell Buckle, Tenn.
Glass, Samuel Kenelm,	Bus.,	Northampton.
Glenn, Graeff William,	M.E.,	Elkins Park.
Godshalk, Gerald Desmond,	E.M.,	Lansdale.
Goldstein, Samuel,	B.A.,	Atlantic City, N. J.
Gordon, Malcolm Kenneth, jr.,	E.E.,	Warrenton, Va.

Gorgas, Charles Crawford,	Bus.,	Paterson, N. J.
Griesemer, David Elias,	M.E.,	Allentown.
Griffiths, Thomas Sharpe,	M.E.,	Plymouth Meeting.
Grim, Harry Roberts,	B.A.,	Shelly.
Gunther, Frank Joseph,	Bus.,	Brooklyn, N. Y.
Haas, Charles Francisco,	E.E.,	Mexico.
Haefecker, George Augustus,	B.A.,	Tamaqua.
Halteman, Austin Shaffer,	C.E.,	Allentown.
Hanlon, James Paul,	E.E.,	Freeland.
Harley, John Scott,	M.E.,	Coatesville.
Harris, Arthur Digley,	C.E.,	Hackensack, N. J.
Harris, Murray Duncan,	E.M.,	Marquette, Mich.
Hartke, John Joseph, jr.,	E.E.,	Elk Ridge, Md.
Havens, James Curtis,	Bus.,	Bridgeport, Conn.
Hayes, Daniel Frank, jr.,	E.E.,	Paterson, N. J.
Heath, Donald Austin,	E.M.,	Jersey City, N. J.
Hendershott, Harold Clark,	E.M.,	Newton, N. J.
Henke, Herman John,	E.E.,	Honesdale.
Henry, Alvan LeRoy,	Bus.,	Flemington, N. J.
Henry, Gerald Boyd,	B.A.,	Buffalo, N. Y.
Herman, Morgan Frederic,	Bus.,	Middletown, N. Y.
Hess, Harry Charles,	Bus.,	Massillon, O.
Hoffman, Kenneth Landes,	E.M.,	Vintondale.
Holloway, Albert Marks,	B.A.,	Alden Station.
Holmes, John Middleton,	Met.,	New York, N. Y.
Hornbaker, Donald Griffin,	M.E.,	Clark's Summit.
Hotchkiss, Clarence Francis,	Bus.,	Binghamton, N. Y.
Huaman, Filiberto,	M.E.,	Lima, Peru.
Hubbard, Sheldon Crouter,	E.M.,	Palma Sola, Fla.
Hunter, Joseph Eastham,	Ch.E.,	Philadelphia.
Huyette, Samuel Louis,	Bus.,	Philadelphia.
Jackson, Joseph Gray,	Ch.E.,	Bala.
Jarvies, Edward Aloysius,	Met.,	East Orange, N. J.
Jedlicka, Frank Eugene,	E.E.,	Baltimore, Md.
Jennings, Albert Edward	C.E.,	Bethlehem.
Johnsen, Ernest Andrew,	Chem.,	Warren.
Johnston, Walter Baer,	Bus.,	Schuylkill Haven.
Kear, Frank Gregg, jr.,	E.E.,	Minersville.
Keen, Frank Porter,	Bus.,	Baltimore, Md.
Keller, Charles Ferdinand,	Ch.E.,	Harrisburg.

Kempf, Arthur William,	Ch.E.,	Bethlehem.
Kennedy, Richard Morris,	E.E.,	Lansford.
Kenworthey, William Bartle, jr.,	B.A.,	Milford.
Kiefer, Elmer Joseph,	E.E.,	Stroudsburg.
King, Frederick William Forbes,	M.E.,	Glen Head, N. Y.
Knerr, Russell Peter,	B.A.,	Allentown.
Knipe, Septimus Leon,	C.E.,	Bethlehem.
Kutz, Samuel Edward,	M.E.,	Easton.
Lang, George Isaac,	M.E.,	Brooklyn, N. Y.
Laramy, William John,	E.M.,	Altoona.
Law, Hartland,	Ch.E.,	Camden, N. J.
Lesh, Stogdell Stokes,	E.E.,	South River, N. J.
LeVan, James Henry,	C.E.,	Minersville.
Levin, Nathan,	M.E.,	Trenton, N. J.
Lewin, Henry,	Bus.,	Malden, Mass.
L'Hommedieu, Paige Drake,	Bus.,	New Brunswick, N. J.
Light, John Dirks,	B.A.,	Lebanon.
Linck, Robert Charles,	C.E.,	Philadelphia.
Lister, William Harry,	M.E.,	Rockville Centre, N.Y.
Loebell, Richard E.,	Ch.E.,	New York, N. Y.
Long, George Davis,	C.E.,	Bolivar.
Looker, Kenneth Estler,	Bus.,	Boonton, N. J.
Louden, John Franklin, jr.,	M.E.,	Amityville, N. Y.
Loyd, William Fisher,	E.E.,	Gary, Ind.
Lucente, Romeo Julius,	Bus.,	Bethlehem.
Ludwig, Richard Gustave,	Bus.,	Philadelphia.
Lum, Philip Livingston Swinnerton,	Bus.,	Chatham, N. J.
McBride, John Joseph, jr.,	M.E.,	Hazleton.
McCance, Edward Gilmour,	B.A.,	Bethlehem.
McCormick, Neil James,	Met.,	Bethlehem.
McDermott, Charles Bernard,	E.E.,	Allentown.
McFarlan, Alden Irving,	M.E.,	Bayonne, N. J.
McGoldrick, Hugh Francis,	Bus.,	Medford, Mass.
McKenzie, Frank Russell,	M.E.,	New York, N. Y.
McLean, Louis Alexander,	Bus.,	Chester.
McMahon, Rogers Dudley,	E.E.,	Sewickley.
Mackey, Theodore William,	E.E.,	Bethlehem.
Maiese, Domenick,	E.E.,	Camden, N. J.
Manuel, David Fuller,	C.E.,	Philadelphia.
Mapes, Harold Edward,	Bus.,	Glen Ridge, N. J.

March, Robert Carl Richard,	Bus.,	Philadelphia.
Marcus, Morey,	Bus.,	Paterson, N. J.
Mastriani, Samuel Gabriel,	C.E.,	Dunmore.
Mattern, Robert Jones, jr.,	Bus.,	Huntingdon.
Maxwell, John Walter, jr.,	N.E.,	Philadelphia.
Meden, Frederick Elof,	E.E.,	Chatham, N. J.
Mercur, Frederic,	B.A.,	Hazleton.
Merrill, Howard Elwood,	B.A.,	Garrett.
Meurer, Louis George, jr.,	Bus.,	Flushing, N. Y.
Meyers, Edgar Janvier,	E.E.,	Bridgeton, N. J.
Meyers, William Earl,	Bus.,	East Stroudsburg.
Michelena, Damian German,	N.E.,	Lima, Peru.
Miller, Gordon Blair,	Bus.,	Huntingdon.
Miller, Harold Wilson,	M.E.,	Wellsville, N. Y.
Miller, Mahlon Martin,	M.E.,	Sinking Spring.
Miller, Raymond Reeves,	Ch.E.,	Roanoke, Va.
Miller, William James,	Bus.,	Bethlehem.
Mong, Donald McMillan,	E.E.,	Erie.
Monteverde, Francis,	E.E.,	Lambertville, N. J.
Morris, James Reed, jr.,	N.E.,	Pittsburgh.
Morris, Stanford Runyan,	E.M.,	Bristol.
Morrison, James Robert Burns,	M.E.,	Auburn.
Nagle, George Samuel,	E.E.,	Abbottstown.
Neuman, Morton,	B.A.,	Bethlehem.
Nicholas, Charles William,	B.A.,	Butler.
Nicholson, Charles Houston,	Ch.E.,	Bethlehem.
Nitchie, Spencer Holmes,	C.E.,	Cranford, N. J.
Nony, Joseph George,	Bus.,	Brooklyn, N. Y.
Oliver, Donnell N.,	Bus.,	Pittsburgh.
Olwine, John Clayton,	Ch.E.,	Newark, N. J.
Osborn, Howard Milton,	E.E.,	Vineland, N. J.
Oswald, Ernest Paul,	M.E.,	Lancaster.
Pakenham, Edward Dudley, jr.,	B.A.,	Brooklyn, N. Y.
Partridge, Harvey Kelsey, jr.,	B.A.,	Merchantville, N. J.
Pease, George Warren,	Bus.,	Ridgewood, N. J.
Pease, Morris Gabriel,	M.E.,	Steelton.
Perry, John Richard Pattison,	E.E.,	Centreville, Md.
Phillips, Forrest Edwin,	Ch.E.,	Bethlehem.
Phillips, Lockwood,	B.A.,	West Pittston.
Phyfe, Herbert Lloyd,	C.E.,	New York, N. Y.

Pierce, Dewey Lockwood,	B.A.,	Brooklyn, N. Y.
Pierce, Ira Elford,	E.E.,	Peckville.
Poliska, Stephen George,	C.E.,	Taylor.
Pollack, Edward Wells,	Bus.,	New York, N. Y.
Poor, Benjamin Wood,	E.E.,	Glendale, O.
Potteiger, George Milton,	B.A.,	Hamburg.
Presbrey, Clifton Hyde, jr.,	E.M.,	Arlington, N. J.
Prior, Charles Malcolm,	Bus.,	Ridgewood, N. J.
Purcell, William Wendall,	C.E.,	Plainfield, N. J.
Pursel, Robert Newton,	M.E.,	Danville.
Raine, Robert Newton,	M.E.,	Scranton.
Randles, Merritt Emmet,	Met.,	Ogdensburg, N. Y.
Rankin, William Price,	Ch.E.,	Phoenixville.
Rapp, Howard Heath,	B.A.,	Philadelphia.
Rathbone, William Vinton,	Chem.	Parkersburg, W. Va.
Rebmann, Henry Bertram,	E.E.,	Philadelphia.
Reinoehl, John Benjamin,	Bus.,	Tremont.
Rerig, Eugene Lyons,	E.E.,	Hazleton.
Reusch, Walter George,	Ch.E.,	Richmond Hill, N. Y.
Reynolds, Thomas Francis,	M.E.,	Bethlehem.
Rhoades, Benjamin Richard,	Bus.,	Flushing, N. Y.
Rich, Herbert William,	E.M.,	East Orange, N. J.
Richman, Edwin, jr.,	E.E.,	Haddon Heights, N.J.
Rickerich, John Howard,	Bus.,	New York, N. Y.
Rigg, Edward Fletcher,	Bus.,	Burlington, N. J.
Ripalda, Emilio Augusto,	Bus.,	Quito, Ecuador.
Ritter, Stewart Elwood, jr.,	M.E.,	Allentown.
Roberts, Charles Bayard,	C.E.,	Mt. Vernon, N. Y.
Roberts, John Eldon,	Bus.,	Buffalo, N. Y.
Robinson, Hugh Wilson,	Bus.,	Bethlehem.
Robinson, Thomas Edmond,	B.A.,	Trenton, N. J.
Rodgers, William Berleau,	B.A.,	Bellevue.
Roeder, Elton Mohr,	E.E.,	Bethlehem.
Rush, Frank Schuyler,	B.A.,	Southampton.
Sall, George Leonard,	Bus.,	Philadelphia.
Sarson, Harry Fowler,	Bus.,	East Orange, N. J.
Sauerbrun, Irving Nelson,	C.E.,	Elizabeth, N. J.
Sawyer, Leonard Koewson,	E.E.,	Swarthmore.
Schellenger, Edward Augustus York,	B.A.,	Camden, N. J.

Schmidt, John Henry,	M.E.,	Morristown, N. J.
Schmoyer, Paul William,	Bus.,	Allentown.
Scholly, Francis Roydon,	B.A.,	Bethlehem.
Schuhle, Frank Frederick,	Bus.,	Brooklyn, N. Y.
Schulman, Maurice,	Bus.,	Bayonne, N. J.
Schwartz, Siegmund Philip, jr.,	E.E.,	Bridgeport, Conn.
Schwimmer, Herman Victor,	Bus.,	Brooklyn, N. Y.
Scott, Wilson Winfield, jr.,	E.E.,	Catasauqua.
Scrivener, Samuel, jr.,	E.M.,	Washington, D. C.
Seaman, Herbert Henderson, jr.,	Bus.,	Plainfield, N. J.
Seeley Harold Morris,	Bus.,	Keansburg, N. J.
Shaheen, Philip Joseph,	Bus.,	Cranford, N. J.
Shapiro, Julian Lawrence,	B.A.,	New York, N. Y.
Shartle, John Adam,	M.E.,	Franklin, O.
Shellenberger, John,	M.E.,	Bayonne, N. J.
Sheppard, Kenneth Anthony,	C.E.,	Bridgeton, N. J.
Shiner, Mervin Righter,	B.A.,	Bethlehem.
Shipley, Herbert Mapes,	E.E.,	Brooklyn, N. Y.
Shoup, Raymond Arthur,	E.E.,	Reading.
Shuhart, John Henry,	E.E.,	Bethlehem.
Sigler, Lucius Martin,	Bus.,	Cleveland, O.
Smith, Charles Edward,	Chem.,	Bethlehem.
Smith, Frederic Calvin,	B.A.,	Pen Argyl.
Smith, Gilbert Robert,	E.E.,	Jeddo.
Snyder, William Cordes, jr.,	E.M.,	Snow Shoe.
Sparks, Robert,	E.E.,	Far Rockaway, N. Y.
Stein, Emil,	B.A.,	Bethlehem.
Stephens, Fred James,	C.E.,	Franklin, N. J.
Stevens, William Ronald,	C.E.,	Hackensack, N. J.
Stillman, Charles Allen, jr.,	Bus.,	Akron, O.
Stofan, Andrew,	B.A.,	Eckley.
Stofflet, Millard Abraham,	B.A.,	Nazareth.
Swartz, Albert Eugene,	E.M.,	East Stroudsburg.
Taylor, Charles Gibson,	E.E.,	Pittsburgh.
Terwilleger, David Lydecker,	C.E.,	Wyckoff, N. J.
Thompson, William Andrew, 3rd,	B.A.,	Brooklyn, N. Y.
Thorpe, Gardner Belknap,	Bus.,	Babylon, N. Y.
Trainer, Robert Leonard,	C.E.,	Irvington, N. J.
Travis, Frank Glen,	N.E.,	St. Michaels, Md.

Travis, John Thurston,	B.A.,	Paterson, N. J.
Tyson, John,	B.A.,	Princeton, N. J.
Valega, Raul Felix,	E.E.,	Lima, Peru.
Varga, Vincent Ignatius,	B.A.,	Bethlehem.
Vennel, Charles Reed,	Bus.,	Camden, N. J.
Waesche, William Henry, jr.,	Bus.,	Baltimore, Md.
Walters, Emerson LeRoy,	Bus.,	Bethlehem.
Walters, Walter Brittain,	B.A.,	Newark, N. J.
Washington, William de Hertburn,	E.E.,	Riverton, N. J.
Watson, Charles Wilbur,	E.E.,	Madison, N. J.
Watters, John Waldner,	B.A.,	Ashland.
Weaver, Russell,	C.E.,	Allentown.
Weinstein, Benjamin,	B.A.,	Philadelphia.
Weiser, Charles Kistler,	Bus.,	Fullerton.
Wetzel, Roland Martz,	B.A.,	Bethlehem.
White, Henry Brooks,	E.M.,	Philadelphia.
Wickes, Robert Boal,	B.A.,	Mt. Vernon, Va.
Widdowfield, William Crippen,	E.E.,	Clark's Green.
Williamson, Henry Thelebert,	E.M.,	Phillipsburg, N. J.
Wills, James Henderson,	B.A.,	Belleville.
Winchester, Robert Caskey,	B.A.,	Phoenixville.
Wintermute, Gerald Hiles,	E.E.,	Newton, N. J.
Yeager, James Roland,	Bus.,	Reading.
Zug, Charles Keller, jr.,	E.E.,	Philadelphia.
Zurn, Oliver Franklin, 3rd,	Ch.E.,	Philadelphia.

SPECIAL STUDENTS

	Course	Residence
Blough, Arthur Paul,	E.E.,	Johnstown.
Dyche, James Albert,	Bus.,	Towaco, N. J.
Fernandez, Carlos Alberto,	E.M.,	Buenos Aires, Argentina.
Grossman, Walter,	B.A.,	Philadelphia.
Johnson, Benjamin Roger,	Bus.,	Long Beach, Cal.
Moore, James William, jr.,	Met.,	Selma, Ala.
Overlander, Rufus Melvin, jr.,	Bus.,	New York, N. Y.
Patton, Edward Thomas,	M.E.,	Philadelphia.

Potts, George Eckert,	Bus.,	Reading.
Rabinowitz, Simcha,	B.A.,	Brooklyn, N. Y.
Ricapito, Joseph,	B.A.,	Philadelphia.
Schatz, George W.,	E.E.,	Perkasie.
Shen, Dzu-Kun,	Ch.E.,	Hankow, China.
Spiehler, Augustine Merle,	Bus.,	Rochester, N. Y.
Tibolt, Frank Leo,	B.A.,	Bethlehem.
Ziegenfuss, Charles Edwin,	Bus.,	Bethlehem.

STUDENTS IN EVENING SCHOOL OF BUSINESS ADMINISTRATION

The following list includes non-matriculated students who are pursuing courses in the Evening School of Business Administration, described on pages 135-137. The courses in which the students are enrolled are indicated by numbers: 1, Advertising; 2, Accounting Theory and Practice; 3, Business Law; 4, Cost Accounting; 5, Business Finance; 6, Economics.

	Course	Residence
Achenbach, Thomas S.,	2, 3	Nazareth.
Achey, Howard Addison,	4	Bethlehem.
Amrhein, Irving Sterling,	4, 6	Bethlehem.
Alexy, Paul John,	1	Bethlehem.
Atwood, Laurence Charles,	1	Bethlehem.
Bader, Harry Walker,	4	Bethlehem.
Bader, William Charles,	2, 3	Bethlehem.
Baer, John George,	4, 5	Allentown.
Bieber, Truman I.,	4	Bethlehem.
Biehn, Horace L.,	2, 3	Bethlehem.
Birk, Robert Matthias,	5, 6	Bethlehem.
Bitting, Willard P.,	1	Bethlehem.
Bock, Adolph H.,	1, 2, 3	Bethlehem.
Brendle, Herman D.,	4, 5	Bethlehem.
Bush, Frank Royce,	1	Bethlehem.
Clewell, Eschor Barton,	2, 3	Nazareth.
Coffin, Stanley N.,	1, 4, 6	Bethlehem.
Dech, Warren Stoudt,	2, 3	Nazareth.
DeLong, Thomas Frederick,	1, 3	Bethlehem.
Diehl, George,	4	Bethlehem.
Ditterline, Roy E.,	4, 6	Bethlehem.

Doggett, Egbert B., C.E., (*Washington and Lee University*)	4, 6	Bethlehem.
Dorney, Edwin Heberly,	1	Allentown.
Dougherty, James William,	2, 3	Bethlehem.
Dudman, Charles William,	2, 3	Bethlehem.
Eberhart, Isaac K.,	4, 6	Bethlehem.
English, Willard R.,	4	Bethlehem.
Everett, LeRoy Charles,	4, 6	Bethlehem.
Fleischman, Ernest C.,	1, 6	Bethlehem.
Ford, Leslie,	2, 3	Bethlehem.
Haehnle, Edward D.,	4, 6	Bethlehem.
Handwerk, Russell Frank,	2, 3	Bethlehem.
Hanlon, Charles,	2, 3	Bethlehem.
Hecker, Samuel Sherman,	5, 6	Bethlehem.
Heiney, Samuel,	2, 3	Nazareth.
Herstine, Augustus Edward,	4, 5	Bethlehem.
Hicks, James Edward,	2, 3	Allentown.
Hursh, John J.,	4, 6	Bethlehem.
Jacobs, Charles E.,	4, 5	Bethlehem.
Jess, William Henry, E.E., (*University of Pennsylvania*)	1	Bethlehem.
Jones, Lloyd B.,	6	Bethlehem.
Kellow, Walter W.,	2, 3	Easton.
Kern, Clarence Thomas,	2, 3	Allentown.
Kommiller, Clarence H.,	1	Bethlehem.
Krohn, Louis,	1, 2, 3	Easton.
Kunkel, Luther G. N.,	4, 6	Allentown.
Lazarus, William Charles, jr.,	1	Bethlehem.
Litsch, J. M.,	1	Bethlehem.
McLay, Thomas Atkinson,	4	Bethlehem.
Mack, Clarence C.,	3, 4	Bethlehem.
Marsteller, Frank K.,	1	Bethlehem.
Metz, Victor Hoch,	2, 3	Nazareth.
Middleton, T. George,	1	Bethlehem.
Miller, Charles Reinhart,	1	Bethlehem.
Morrison, William,	2, 3	Bethlehem.
Musselman, Floyd R.,	2, 3, 4	Easton.
Otrosina, John Clyde,	2, 3	Bethlehem.
Phillips, J. M.,	1	Bethlehem.
Porter, Clarence Henry,	2, 3	Bethlehem.

Refowich, Harold G.,	2, 3, 5	Bethlehem.
Reichel, Clarence H.,	1	Bethlehem.
Reider, Freeman W.,	4, 5	Bethlehem.
Reis, Morton,	1	Bethlehem.
Ruyak, George Joseph,	4	Bethlehem.
Schaeffer, R. Paul,	4, 5	Allentown.
Schmell, Charles H.,	3, 5	Bethlehem.
Schmidt, Charles B.,	2, 3	Bethlehem.
Seiders, Ralph Ray,	4	Bethlehem.
Sellers, George E.,	4	Bethlehem.
Shiverdecker, Walter McKinley,	1	Allentown.
Smith, Ashton Ernest,	1	Bethlehem.
Smith, Samuel Ringer,	1, 4	Bethlehem.
Snyder, Richard G.,	2	Bethlehem.
Talbot, Peter J.,	1	Bethlehem.
Wallower, Clarence Irvin,	4, 5	Bethlehem.
Wanamaker, W. C.,	1	Bethlehem.
Weikel, Charles Henry Harrison,	4, 5	Bethlehem.
Wilde, Ralph Edgar,	2, 3	Bethlehem.
Youngken, Harold H. N.,	4	Allentown.

STUDENTS IN EXTENSION COURSES

The following list includes non-matriculated students who are pursuing collegiate or postgraduate courses from among those listed on pages 129-134 of this Register.

The courses in which students have been enrolled are indicated by numbers as follows: Educational Psychology, 1; Educational Sociology, 2; Principles of Education, 3; History of Education, 4; Secondary Education, 5; Educational Measurements, 6; School Administration, 7; Project Method, 8; Contemporary American Literature, 9; Speech Correction, 10; Education of Subnormal Children, 11; Psychology of Subnormal Children, 12; Advanced Mental Diagnosis, 13; General Geology, 15.

SUMMER SESSION AT LEHIGH UNIVERSITY

	Course	Residence
Adams, Isabel,	10,	Philadelphia.
Armpriester, Helen,	10,	Harrisburg.
Bishop, Louise Antoinette,	10,	Bethlehem.

Borst, Beatrice,	10,	Philadelphia.
Bowman, Blanche,	10,	Philadelphia.
Brownrigg, Jeanette,	10,	Brooklyn, N. Y.
Carroll, Clara, B.A.,	13, 14,	Bethlehem.
Chadwick, Gertrude,	10,	Philadelphia.
Christ, Mary Elizabeth,	10,	Altoona.
Davis, Mrs. Serena Foley,	10,	Philadelphia.
Dissinger, Elizabeth,	10,	Moorestown, N. J.
Drake, Esther,	10,	Philadelphia.
Erb, Russell Caspar,	3,	Conshohocken.
Everett, Cora E.,	10,	West Chester.
Fink, William LeRoy,	1, 3,	Slatington.
Forbes, Elizabeth A.,	10,	Philadelphia.
Frankenberger, Margaret,	10,	Philadelphia.
Gabriel, Sara,	10,	Coopersburg.
Gendall, Grace,	10,	Philadelphia.
Gerst, Helen M.,	10,	Altoona.
Hanigan, Alice,	10,	Philadelphia.
Harper, Robert M.,	1,	Bethlehem.
Hauser, Roderick Ritter,	1,	Allentown.
Hazlett, Helen Steel,	10,	Philadelphia.
Hedding, Margaret M.,	10,	Altoona.
Hitchner, Belle,	10,	Philadelphia.
Hollis, Ella Louise,	10,	Philadelphia.
Jeffers, Margaret,	10,	Philadelphia.
Jones, Elsie M.,	10,	Easton.
Kendall, Esther,	10,	Webster Mills.
Kennedy, Jamieson Douglas,	1,	Bethlehem.
Kessler, Mabel,	13,	Reading.
Kraemer, Olga,	10,	Philadelphia.
Kremer, Elizabeth,	10,	Philadelphia.
Linck,	1, 3,	Slatington.
Lindenmuth, S. Louise,	10,	Reading.
Lorsbach, Elizabeth,	1, 3,	Allentown.
McCormick, Mildred,	10,	Harrisburg.
McNelis, Grace,	10,	Glen Lyon.
Mackay, Martha,	10,	Philadelphia.
Mayer, Marie C.,	10,	Philadelphia.
Miller, Helen A.,	10,	Easton.
Miller, Kathryn Elizabeth,	1, 3,	Alpha, N. J.

Morris, Emma L.,	10,	Philadelphia.
Morris Jennie F.,	10,	Reading.
Murphy, Alice Lewis,	10,	Philadelphia.
Nies, Viola,	10,	Philadelphia.
Parrot, Caryl S.,	10,	Philadelphia.
Paul, Florence Ruth,	1, 3,	Easton.
Rice, Velma Louise,	10,	Easton.
Ruffenbach, Louise,	10,	Philadelphia.
Schick, Myrtle,	10,	Allentown.
Schmittel, Nell B.,	10,	Altoona.
Scureman, Margaret,	10,	Kingston.
Snyder, Anne G.,	10,	Altoona.
Souter, Ruth Jean,	10,	Indiana.
Spahn, Emma H.,	10,	Reading.
Taylor, Robert Norman, B.A.,	1, 3,	Hellertown.
Tyson, Sara E.,	10,	West Chester.
Vignola, Rose Anna,	10,	Philadelphia.
Villee, Sallie Helen,	10,	Bethlehem.
Webb, Charlotte B.,	10,	Philadelphia.
Wilson, Ethel V.,	1, 3,	Alpha, N. J.
Wilson, Judd W.,	10,	Newark, N. J.
Zerweck, Ethel,	1,	Bethlehem.

SUMMER SESSION AT THE TRAINING SCHOOL OF VINELAND, N. J.

	Course	Residence
Allen, Margaret,	12, 13,	Akron, O.
Anastasia, Sister Mary,	12, 13,	Jefferson, Wis.
Bourke, Elizabeth,	12, 13,	Waterbury, Conn.
Campbell, Catherine,	12, 13,	Houston, Tex.
Coleman, Ida,	12, 13,	Honesdale.
Dare, Edith,	12, 13,	Woodcliff-on-Hudson, N. Y.
Ek, Mrs. Anna M.,	12, 13,	Brockton, Mass.
Estes, Marion,	12, 13,	Rochester.
Fleming, Betty G.,	12, 13,	Torrington, Conn.
Forsyth, Mary E.,	12, 13,	Batavia, N. Y.
Galbraith, Letty,	12, 13,	Spartanburg, S. C.
Hayes, Mary,	12, 13,	Torrington, Conn.
Heller, Mrs. Hannah M.,	12, 13,	East Stroudsburg.
Henry, Janet P.,	12, 13,	Jersey City, N. J.

Hoesley, Emma B.,	12, 13,	Yakima, Wash.
Hopler, Bernice D.,	12, 13,	Bartley, N. J.
Hoss, Alma,	12, 13,	Indianapolis, Ind.
Howarth, Mrs. Henriette,	12, 13,	Newark, N. J.
Hughes, Mrs. Helen,	12, 13,	Perry, N. Y.
Kugler, Edna M.,	12, 13,	Harrisburg.
Lashley, Elizabeth,	12, 13,	Centerville, Ind.
McNally, May E.,	12, 13,	Jersey City, N. J.
McQullen, Pauline,	12, 13,	Pittsburgh.
Madeline, Sister Mary,	12, 13,	Jefferson, Wis.
Pagaud, Elizabeth,	12, 13,	New Orleans, La.
Perkins, Jeanette,	12, 13,	Baltimore, Md.
Smull, Alice L.,	12, 13,	Danville.
Thorpe, Amy,	12, 13,	Highgate, London, Eng.
Trible, Diordre,	12, 13,	Evansville, Ind.
Vail, Marjorie,	12, 13,	Evanston, Ind.
Vail, Mrs. Sophia B.,	12, 13,	Evanston, Ind.
Walker, Mabel Stuart,	12, 13,	Petersburg, Va.
Watkins, Lida,	12, 13,	Baltimore, Md.

FIRST TERM, 1922-1923

	COURSE	RESIDENCE
Allen, Dorothy,	4,	Bethlehem.
Amrheim, Virginia,	8,	Bethlehem.
Baas, Florence Edith,	8,	Bethlehem.
Babcock, Mary Kirk,	6, 7,	Bethlehem.
Bachert, Charles W.,	2,	Bethlehem.
Balliet, Kate S.,	8,	Bethlehem.
Beary, Joyce Elizabeth,	9,	Allentown.
Beattie, Marjorie, A.B.,	1,	Bethlehem.
Belzer, Mary Elizabeth,	2,	Bethlehem.
Benner, Emma Susan,	4,	Bethlehem.
Briody, Catherine Beatrice,	2,	Bethlehem.
Brown, Mrs. Ella Van Dyke,	2,	Bethlehem.
Buckley, Ella Veronica,	2,	Bethlehem.
Burke, Nellie Elizabeth,	2,	Bethlehem.
Clark, S. Naomi,	2,	Bethlehem.
Conlin, Mary,	2,	Bethlehem.

Conner, Anna Evelyn,	2,	Bethlehem.
Crow, Mary Matilda,	8,	Bethlehem.
Drohan, Margaret Agnes,	2,	Bethlehem.
Dwyer, Mary Margaret,	2,	Bethlehem.
Eagan, Eleanora Frances,	2,	Bethlehem.
Erb, Elsie N.,	2,	Bethlehem.
Fairchild, Enola,	9,	Bethlehem.
Fegley, Claude A.,	1,	Bethlehem.
Fisher, Carrie Cecilia,	8,	Bethlehem.
Folk, Mrs. Hannah Elizabeth,	2,	Bethlehem.
Forrest, Martha C.,	4,	Bethlehem.
Fox, Catherine,	2,	Bethlehem.
Gallagher, Mary Genevieve,	2,	Bethlehem.
Ganly, Gertrude F.,	2,	Bethlehem.
Gavin, Mrs. Emma,	2,	Bethlehem.
Haytock, Mae Evelyn,	1,	Bethlehem.
Heberling, Ella Louise,	4,	Bethlehem.
Heilman, Jennie M.,	2,	Bethlehem.
Hemsath, Elizabeth,	4,	Bethlehem.
Henry, Fannie,	2,	Bethlehem.
Herbin, Mabel,	2,	Bethlehem.
Hess, Lloyd Cornelius, B.A., (*Lehigh University*)	8,	Bethlehem.
Hildebrand, Agnes,	2,	Bethlehem.
Horne, Dorothy,	8,	Bethlehem.
Keefe, Nora,	2,	Bethlehem.
Kleckner, Ruth Emma,	1,	Bethlehem.
Kramer, Eileen Lois,	5, 7,	Coplay.
Krause, Anna Catherine,	8,	Bethlehem.
Krause, Blanche I.,	8,	Bethlehem.
Kressler, Helen Roseberry,	4,	Finesville, N. J.
Kunsman, Mamie E.,	4,	Bethlehem.
Laubach, Stewart Lorine,	2,	Bethlehem.
Long, Evelyn E.,	8,	Bethlehem.
Long, Violet E.,	8,	Bethlehem.
Lopp, Mildred,	1,	Nazareth.
Loesbach, Elizabeth M.,	2, 8,	Bethlehem.
Lucey, Mary Elizabeth,	2,	Bethlehem.
Luchenbach, Martha Olga,	8,	Bethlehem.
McBride, Annie,	2,	Bethlehem.

McGuinness, Elizabeth,	2,	Bethlehem.
Mack, Edith Lydia,	4,	Bethlehem.
Maley, Mary,	2,	Bethlehem.
Merwath, Marjorie Geraldine,	2,	Bethlehem.
Metzger, Charlotte Elizabeth,	1,	Reading.
Miller, Georgena,	8,	Bethlehem.
Miller, Mary F.,	1,	Bethlehem.
Miller, Regina G.,	2,	Bethlehem.
Mitman, Esther Froueta,	1,	Bethlehem.
Morshumer, Lina Elizabeth,	2,	Bethlehem.
Mueller, Margaret Joan,	1,	Bethlehem.
Murray, Annie Victoria,	4,	Bethlehem.
Murray, Marion H.,	4,	Bethlehem.
Nolf, Laura A.,	4,	Bethlehem.
Post, Hazel Dell,	2,	Bethlehem.
Ressler, Laura E.,	8,	Bethlehem.
Riley, John David,	1,	Bethlehem.
Roberts, Gertrude May,	8,	Bethlehem.
Schroeder, Julia,	8,	Bethlehem.
Shunk, Marion Helen, B.A.,	1, 6,	Bethlehem.
Silberman, Carolyn Theresa,	2,	Bethlehem.
Solt, Ada,	15,	Bethlehem.
Stroman, Angie C.,	2,	Bethlehem.
Swartz, Ruth A.,	8,	Bethlehem.
Taylor, Robert Norman, B.A.,	5,	Bethlehem.
Thomas, Hannah Victoria,	2,	Bethlehem.
Torpey, Elizabeth Geraldine,	2,	Bethlehem.
Vaughn, Amy,	4,	Bethlehem.
Weber, Dorothea,	1,	York.
Weil, Emma Catherine,	4,	Bethlehem.
Weiser, Abby Catharine,	4,	Bethlehem.
Wilcox, Evelyn Florence,	2,	Bethlehem.
Worman, Claire,	8,	Bethlehem.
Zell, Harry Allen,	1,	Bethlehem.

SUMMARY OF STUDENTS BY CLASSES AND COURSES

	*Graduates	Seniors	Juniors	Sophomores	Freshmen	Specials	Totals
Arts & Science	27	21	38	36	51	4	177
Business Adm..	5	20	35	41	89	6	196
Civil Eng.......	3	35	24	22	31		115
Mech. Eng......	4	27	29	29	47	1	137
Mining Eng....	1	27	29	25	19	1	102
Metallurgy......	1	12	13	10	4	1	41
Electric. Eng...	1	36	29	28	61	2	157
Chemistry.......	6		1	2	3		12
Chem. Eng......		21	20	38	20	1	100
Naval Eng......		6	5	8	7		26
Totals	48	205	223	239	332	16	1063

*Graduate students are listed in the department in which they are taking their major subject.

Students in Evening School of Business Administration.	79
Students in Extension Summer Session, 1922..........	98
Students in Extension Courses, First Term, 1922-23...	89
Total	266

GEOGRAPHICAL SUMMARY OF STUDENTS

Alabama	1
Arkansas	1
California	2
Colorado	1
Connecticut	16
Delaware	2
District of Columbia	27
Florida	4
Georgia	1
Illinois	7
Indiana	1
Maryland	39
Massachusetts	10
Michigan	7
Missouri	1
New Jersey	204
New York	111
North Carolina	1
Ohio	15
Oregon	1
Pennsylvania	563
Rhode Island	4
South Carolina	1
Tennessee	1
Texas	1
Utah	2
Vermont	1
Virginia	8
West Virginia	7
Wisconsin	1
Wyoming	1
Argentine Republic	1
Brazil	1
China	5
Colombia	1
Cuba	1
Ecuador	1

Greece	1
Mexico	3
Peru	4
Siam	1
Venezuela	2
	1062

INDEX

Administrative Officers, 16
Admission of Students, 19, 22
  Requirements, 19
Advanced Standing, Admission to, 21
Almanac, 2
Alumni Association, 177
Alumni Prizes, 178
  Award in 1922, 168
Alumni Prizes for Oratory, 178
Arboretum, 165
Arts and Science Club, 167
Arts and Science, College of
  Description, 32
  Requirements for admission, 19
  Schedules of Studies, 34-37
  Undergraduate courses, 77
Assistant Professors, 10
Associate Professors, 8
Astronomy
  Graduate courses, 138
  Observatory, 161
  Undergraduate courses, 94
Athletic Field, 164
Biology
  Graduate courses, 144
  Undergraduate courses, 110
Buildings, **151**
Business Administration, College of
  Description, 41
  Evening School, 135
  Graduate courses, 140
  Requirements for admission, 19
  Schedule of studies, 43
  Undergraduate courses, 80
Calendar, 3
Callender Fellowship, 175
Carson Prize, 176
Certificates, 22
Chandler Chemical Laboratory, 152
Chandler Chemistry Prizes, 176
  Award in 1922, 169
Chemical Engineering, Course in
  Description, 69
  Requirements for admission, 19
  Schedule of studies, 73
Chemistry, Course in
  Description, 66
  Graduate courses, 146
  Requirements for admission, 19
  Schedule of studies, 68
  Undergraduate courses, 121
Christmas Hall, 160
Civil Engineering, Course in
  Description, 44
  Graduate courses, 148
  Requirements for admission, 19
  Schedule of studies, 47
  Undergraduate courses, 95
College Commons, 163
Conference Department, 16, 129
Coppee Hall, 160
Coxe Memorial Fund, 175
Coxe Memorial Library, 162
Coxe Mining Laboratory, 159
Departmental Societies, 166
Dormitories, 162
Drown Memorial Hall, 163
Economics
  Graduate courses, 140
  Undergraduate courses, 80
Economic Geography, 84
Education
  Graduate courses, 145
  Undergraduate courses, 78
Electrical Engineering, Course in
  Description, 61
  Graduate courses, 142
  Requirements for admission, 19
  Schedule of studies, 65
  Undergraduate courses, 116
Electrical Eng. Prize, 176
  Award in 1922, 169
Engineering Societies, 166
English
  Graduate courses, 139
  Undergraduate courses, 92
Examinations, Entrance, 20
  Examinations at schools, 23
Expenses, 150
Extension Courses, 129
Faculty, 6
  Committees, 17
Forestry, 110
Founder's Day, 167
Frazier and Ringer Memorial Fund, 181
Fritz Engineering Laboratory, 158
French
  Graduate courses, 146
  Undergraduate courses, 89
Geology
  Graduate courses, 143
  Undergraduate courses, 106
German
  Graduate courses, 143
  Undergraduate courses, 88
Graduate Courses
  Admission to, 22, 137
  List, 138
Greek
  Graduate courses, 141
  Undergraduate courses, 87
Gymnasium
  Description, 163
  Physical education, 128
Haines Scholarship, 174
History
  Graduate courses, 140
  Undergraduate courses, 84
Honor List, 1922, 169
Honor System, 167
Honorary Scholarship Societies, 166
Instructors, 13
Italian
  Graduate courses, 146
  Undergraduate courses, 91

Latin
  Graduate courses, 149
  Undergraduate courses, 85
Lecturers, 10
Lectures, 166
Library
  University Library, 162
  Officers of, 17
  Coxe Memorial Library, 162
List of Studies
  Graduate courses, 134
  Undergraduate courses, 77
Mathematics
  Graduate courses, 138
  Undergraduate courses, 94
Mechanical Engineering, Course in
  Description, 48
  Requirements for admission, 19
  Schedule of studies, 51
  Undergraduate courses, 99
Mercur Scholarships, 174
Metallurgy, Course in
  Description, 52
  Graduate courses, 149
  Requirements for admission, 19
  Schedule of studies, 55
  Undergraduate courses, 103
Military Science and Tactics, 126
Mining Engineering, Course in
  Description, 56
  Graduate courses, 142
  Requirements for admission, 19
  Schedule of studies, 60
  Undergraduate courses, 112
Museums, 165
Observatory, 161
Packer Hall, 151
Packer Memorial Church, 17
  Description, 161
  Services, 167
Philosophy
  Graduate courses, 145
  Undergraduate courses, 78
Physical Education, 128
Physics
  Graduate courses, 147
  Undergraduate courses, 114
Physics Laboratory, 153
Political Science, 83
Portuguese, 91
Pre-Medical Course, 37-38
Price Hall, 163
Price Prize, 176
Prickitt Scholarship, 174
Prizes
  Alumni Prizes, 178
  Carson Prizes, 176
  Chandler Prizes, 176
  Electrical Engineering Prize, 176
  Price Prize, 176
  Wilbur Prizes, 176
  Williams Prizes, 179
Professors, 6
Psychology
  Graduate courses, 145
  Undergraduate courses, 77
Romance Languages, 89
Saucon Hall, 160
Sayre Observatory, 161
Sayre Park, 165
Scholarships
  Coxe Memorial Fund, 175
  Haines Scholarship, 174
  Mercur Scholarship, 174
  Prickitt Scholarship, 174
  Wilbur Scholarship, 174
  Williams Fund, 175
Ship Construction and Marine Transportation, Course in
  Description, 74.
  Graduate courses, 148.
  Requirements for admission, 19
  Schedule of studies, 76
  Undergraduate courses, 124
Site of the University, 151
Spanish
  Graduate courses, 146
  Undergraduate courses, 91
Students, List of, for 1922-1923, 182
  Graduate Students, 182
  Seniors, 185
  Juniors, 190
  Sophomores, 196
  Freshmen, 202
  Special Students, 210
  Extension Course Students, 213
  Summary of Students:
    By Classes and Courses, 219
    By Geographical representation, 220
Studies, List of, 77
Summer Term, 136
Taylor Field, 164
Taylor Gymnasium, 163
Taylor Hall, 162
Teachers' Courses, 38
Theses, 168
Trustees, 4
  Committees, 5
  Honorary Alumni Trustees, 4.
  Officers of the Board, 5
Tuition, 150
Undergraduate Courses, 77
University Day, 168
University Sunday, 167
Wilbur Engineering Laboratory, 155
Wilbur Prizes, 176
  Award in 1922, 168
Wilbur Scholarship, 174
  Award in 1922, 168
Williams Fund, 175
Williams Hall, 156
Williams Prizes, 179
Y. M. C. A., 167